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THE HANDLING OF MASSES OF ARTILLERY, WITH SPECIAL REFERENCE TO THE PREPARATION FOR THE INFANTRY ATTACK, AS ILLUSTRATED BY THE FRENCH EXPERIENCES AT THE CAMP OF CHALONS, IN 1892.

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Introduction.

WHEN I speak of employing artillery in masses, I mean the concentration for some definite end of a larger number of pieces than are contained in a tactical unit. They may be thus combined to subdue the enemy's guns, to make or repel a flank attack, to fill a gap, or strengthen a weakened point in a line of battle. But the most salient example of such concentration is to clear the path for the infantry advance, and frequently, or even generally, the other combinations are but subsidiary, and lead up to that grand finale.

Such a method of handling guns is not new, and I believe all the greatest masters of the art of war have preferred, when possible, so to use them.

The Great Frederick never forgot the fundamental principle of keeping the fire of his guns concentrated as far as might be on one target. The guns with which he had to deal were, however, possessed of but small mobility, and were often not equal to the task set them. Tempted on such occasions to dispense with them, as at Kunersdorf, the King was taught by disaster how much the loss of their co-operation meant, while at Torgau the power of a vast combination of pieces was again brought home to him by defeat, and all

the more strikingly so because it was the inherent power of the guns themselves, undirected by skill or judgment, and, indeed, in spite of a want of it, that gave them the advantage. The next great military genius after the time of Frederick turned artillery to account more effectively, perhaps, than any other leader before or since, and the same instinct that led him to strike with overpowering force at some decisive point of his opponent's line, taught him also to supplement his blow with a concentrated artillery fire. At Wagram, Lauriston massed 100 guns against the Austrian centre; at Friedland, it was the bold advance of the artillery belonging to two divisions combined under the hand of Senarmont that turned the scale, while Borodino and Waterloo illustrate the same tactics. Yet, in spite of the teaching of history, the secret of handling artillery was forgotten until, in 1870, the huge batteries of Woerth, Vionville, Gravelotte, and Sedan made men stare as though a new epoch in war had opened upon them. Yet examples from the American war might have reminded them, had they been attended to, that the principles which govern artillery tactics had not disappeared with the glories of the Empire, for the long lines of batteries at Gettysburg, and Longstreet's decisive blow at Manassas—a feat worthy of the highest traditions of the arm—convey a lesson as telling as anything that may be culled from the annals of Frederick or Napoleon. And now that modern thought is busy with the study of war, what do we find? One of Napoleon's maxims in the mouth of every gunner who has written lately on artillery, "Concentration, suddenness, and rapidity of execution"; these are the watchwords of the artillery to-day, and what are they but a paraphrase of the great master's words: "Victory will be his who understands how to bring a great mass of guns into action unexpectedly"?

The correct application of artillery shows, indeed, but another aspect of that great fundamental principle of war, which teaches us to strike strongly, swiftly, and suddenly when we mean our blow to go right home.

And tactical soundness is the basis on which technical excellence must rest. Tactics will not teach strategy, nor musketry and gunnery tactics. It would be irrational to expect battalions, however well they might individually acquitted themselves at the butts, to be fit and ready, without previous experience or training, to work successfully as portions of the large units of the battlefield. There is something for them to learn besides musketry, and it is to enable them and their leaders to study the application of their skill in musketry to the tactical situation of the moment that we organize field days and manœuvres.

Yet with our artillery, although gunnery and practice are now very carefully and well attended to, but little opportunity is given to the majority of officers to study a very difficult side of their profession; while, until the present moment, we have had little practical experience as to ammunition supply. In India, where there are better opportunities, much more has certainly been effected, and it would be difficult to carry out anything more realistic than the field firing

exercises organized some years ago by the late Sir Thomas Baker at Rawul Pindi. Yet I think every one will admit that powers of supervision will be demanded on the part of those who have to direct the artillery of a modern army at least as great as those required for the leadership of a division, or even a corps. But should we ever adopt a more excellent way, I hope it will not be forgotten that ideal artillery manœuvres will demand the presence of the other arms. There lurks a danger that practice carried out by artillery officers alone will become too technical. That, I know from private sources, has been a difficulty felt in France, and there was a strong desire felt by the French artillery for the co-operation of their comrades of the infantry and cavalry in their field firing manœuvres, of which I hope to tell you something now. It was not found possible to work all the arms together, however, and so, although Châlons is a camp for all arms alike, such as is Aldershot with us, the infantry were not only absent from the manœuvres we shall deal with to-day, but they were absolutely unrepresented, and their existence, although it was taken into account, was purely hypothetical. It would certainly have added greatly to the interest and to the instruction had skeleton brigades and divisions been on the field. However, such was not the case, and although, therefore, the whole artillery of an army corps was placed in the field, and it was supposed to act in conjunction with other troops, they existed only in imagination.

It will help us in our consideration of what took place if I briefly give an account of how the French artillery units are organized, and of the systems of command in vogue.

A French army corps is divided into two divisions. Each division has six batteries, divided into two "groups" of three batteries each, allotted to it.

The corps artillery consists of six field batteries, divided into two groups, as before, and of two horse artillery batteries, forming a third "group."

The brigade of artillery attached to a corps d'armée is divided into two regiments. Of these, one regiment finds the divisional artilleries, and the other the corps artillery.

The staff of each regiment consists of 1 colonel, 1 lieutenant-colonel, 5 *chefs d'escadrons*, 1 major, 3 captains, 2 captains *en second*, employed as "adjutant majors," who are taken from the establishment of the batteries, 2 doctors, 3 veterinary surgeons, and 1 lieutenant, who assists the captain acting as paymaster. In all 17 officers, and 28 riding horses.

Both horse and field batteries have five officers. That is to say, 1 captain-commandant, 1 captain *en second*, who, however, is rarely doing duty with the battery, and 3 lieutenants or sub-lieutenants.

Two ammunition columns (*sections de munitions*) are attached to the artillery of each division and to the corps artillery.

A field battery at war strength consists of 6 guns, 9 ammunition wagons, and 1 battery, 1 forge, and 1 forage wagon. A horse artillery battery belonging to the corps artillery has the same number

of guns and wagons, but when belonging to the cavalry division has only 8 ammunition wagons.

Each ammunition column (*section de munitions*) is composed of 12 ammunition wagons.

A French battery at war strength is thus disposed of in the field:—

The six guns and three of the ammunition wagons form what is called the *batterie de tir*. When the guns are in action, the normal formation is for the three wagons to be drawn up covering the sections to which they belong, with their teams harnessed to them facing to the front, the heads of the horses 15 metres from the trails. Behind these are placed the limbers covering their guns, with the heads of their horses 10 metres from the rear of the line of wagons in front of them.

The remaining six wagons and the other carriages belonging to the battery form the *échelon de combat*, and are drawn up usually either directly in rear of the *batterie de tir*, or on its flank, and at 500 metres or more from it. It is, however, open to the captain, if he judges it necessary—and usually I suppose he would do so—to send away the limbers and the teams of the wagons of the *batterie de tir*, and they are then led away to shelter either on the flanks or in rear, but they are never placed more than 250 metres from their belongings.

To proceed to an account of the experiences of our neighbours.

Since the year 1884 a certain number of regiments of the French artillery have visited the camp at Châlons every year, for the purpose of taking part in manœuvres and field firing on a large scale. According to information which a French officer has kindly placed at my disposal, each regiment first carries out its own practice, much as our batteries do at Okehampton, and, when this course is completed, a certain number of batteries are united to form the equivalent of the artillery of an army corps (20 batteries). These take part in manœuvres massed together, and finally are put through a course of field firing under the same conditions. These exercises of large masses are intended chiefly for the instruction of senior officers in handling a great number of guns, and, in fact, they are termed "The School for Generals and Colonels of Artillery."

Since 1885 no detailed account of the operations has, however, appeared until last November, when the experiences of the previous summer were minutely described in the "*Revue d'Artillerie*," by Lieutenant-Colonel Cohadon, of the French artillery.

This account has aroused a good deal of attention in Germany, where nothing quite so realistic, or on so complete a scale, has as yet been accomplished. And it may be noted that the French clearly are attaching an increasing importance to such exercises, for while in 1884 eight days were held sufficient, fourteen were devoted to them last summer.

As we have stated, Châlons was the scene of operations, and the whole artillery of an army corps on a war footing, with all its wagons, was brought into the field. The guns were drawn by six horses, the other carriages belonging to the battery by four.

The guns and wagons available were organized as two divisional

artilleries, both containing two "groups" ("brigade divisions") of three field batteries each and two ammunition columns (*sections de munitions*) and a corps artillery, which consisted of one group of three field batteries, one group of three, and one of two horse artillery batteries,¹ and two ammunition columns (*sections de munitions*). Altogether, therefore, 15 field batteries, 5 horse artillery batteries, and 6 ammunition columns were brought into the field. The Staffs of the officer commanding the artillery of a corps d'armée and also those belonging to the divisional and corps artilleries were all present in full strength according to the war establishment.

The manœuvres were carried out under the direction of the Lieutenant-General who is President of the French Artillery Committee, and he issued instructions every evening as to the work that was to be done the following day.

During the first week the two divisional artilleries and the corps artillery worked independently of one another. Then the divisional artilleries were strengthened by the addition of one or two batteries from the corps artillery, and finally, during the second week, the entire artillery of the corps d'armée worked together under the direction of one leader.

The batteries and columns on approaching the ground were placed in those positions in which they would, under real circumstances, have found themselves on the line of march of the divisions or columns; and it was only in order to save time as much as possible that the intervals between the larger units were somewhat curtailed.

During the first week the practice was usually set on foot in this way. A division formed in column of march was ordered to deploy in order to repel the attack of an enemy supposed to be advancing upon it from a given direction.

The artillery of the advanced guard, which usually consisted of one group (brigade division)—when it had been made particularly strong, of two—was then brought into action to engage the hostile artillery.

After the artillery of the main body had come up and had been got into position to support the guns of the advanced guard, the enemy was supposed to have been checked and the infantry sent forward to the attack.

The artillery now moved forward again in support of this movement, and took up a second position from which it continued to engage the hostile batteries, assisted to repulse several attempts at a counter-attack, and finally concentrated all its force on the point of the enemy's line which had been selected for assault, and thus prepared the way for the final rush of the infantry.

When the whole corps was to practise together it was assumed that it had advanced on two roads. One division marched on each road, and on one or other the corps artillery followed also. As soon as the presence of the enemy had been thoroughly ascertained, the guns of one division were brought into action, and were reinforced

¹ Usually the corps artillery in France would consist of 2 groups of 3 field batteries each, and 1 of 2 horse artillery batteries.—E. S. M.

subsequently by the other groups until all the guns belonging to the corps were brought into a first position from which they commenced to fire upon the artillery of their opponents. Then, when subsequently the infantry were supposed to have moved forward, the guns were advanced to their support by échelons, large or small, according to circumstances, to a second position, from whence they now entered on a decisive struggle with the hostile batteries. When the fire of these was supposed to have become subdued, all the guns of the attack were turned on the point selected for assault. Finally, when the assault was considered to have been successful, a "group" or brigade division of horse artillery was sent on at a gallop to secure the ground which had been won.

From the first position the ranges were usually from 2,500 to 3,500 metres,¹ and the first and second positions were generally from 1,200 to 1,800 metres apart. The shortest range from the second position was 1,000 metres.

The front occupied by all the artillery of the corps when deployed was from 2 to 3 kilometres.²

Whatever may be thought as to the tactical idea which underlay these schemes, there is no sort of doubt that since 1884 very great progress in the handling of large masses of artillery has been made. At that period, I understand that for the first two days groups only manoeuvred together and only used blank cartridges. At that time there was even some doubt as to how many batteries should form a group. Then, too, it was only on the third day of the manoeuvres that projectiles were taken into use, and even then a scheme was only carried out which had been carefully rehearsed with blank on the previous day.

Even during the latter days of those exercises it was not thought safe to practise with projectiles when all the guns of the corps were united together, unless after the same kind of rehearsal of all that was to take place. The ranges, too, have of late been increased, for in 1884 guns usually fired at 2,000 metres, and in no case was a range of 2,700 metres exceeded.

Colonel Cohadon has given a complete list of the experiences arrived at during the practice, from which, however, only the most important are here dwelt upon.

Orderlies.

The orderlies (*agents de liaison*) who were made use of to carry orders and messages appear to have given complete satisfaction, as few comments are appended to the report on this part of the work. The fact, however, that they are noticed first of all is noteworthy, and illustrates a sound principle, for in order to handle large masses of artillery with success it is above all things necessary that a good system of carrying instructions should be devised, and that the closest connection between the different component parts of the

¹ 100 metres = 109'363 yards.—E. S. M.

² About 1½ to 2 miles.—E. S. M.

masses should be established. From some correspondence I have had with a French officer who was present, I learn that these *agents de liaison* are sometimes officers and sometimes non-commissioned officers, but they all have preliminary instruction in their duties with their regiments. This seems to me very necessary, for men not only of great intelligence, but specially trained to the work, will be required if orders are not to miscarry and mistakes as to the renewal of ammunition are not to be made.

Preliminary Positions.

As regards preliminary positions, officers were enjoined to take special care that all the preparations for opening fire might be accomplished without attracting the attention of the enemy. Guns were loaded before being moved into position.

It is noteworthy that since 1884 fire discipline must have considerably increased in the French Service, because in that year orders were issued forbidding loading in the preliminary position, as it was thought then that this custom would lead to a too hurried fire, and it was even feared that the safety of troops on one's own side might be thus placed in jeopardy.

First Fire Position.

High ground, we are told, should be selected when possible for the first firing position, and behind the cover thus afforded the batteries should be led into action. The reverse slope should not be too steep, or the labour of bringing the guns up will be excessive, while on the other hand it must not be too gentle, or the guns, when unlimbered, will have to be run forward a long distance by hand, which, especially when the ground is soft, will be most objectionable. The crest line of the height, moreover, should also be as nearly perpendicular to the line of fire as possible. Great attention should be paid to this point, as otherwise a great many inconveniences are likely to arise. When this rule was disregarded, the wagons and limbers often found themselves in so faulty a position that their flank would have been exposed to the enemy's fire. Then their position had to be altered and considerable delay in opening fire was consequently engendered.

Contrary to views which have been largely held with us, Colonel Cohadon recommends that limbers and ammunition wagons should be placed, when possible, directly behind the guns. It is admitted, he says, that they are thus more secure from the effects of the enemy's fire, and that the service of the guns is facilitated. If a battery drive up in a line parallel to the crest, as there is a strong tendency for it to do, and the line of the crest be not at right angles to the line of fire, wagons and limbers drawn up as the French prefer them to be will almost always be badly placed, and when the guns face their objective and the wagons and limbers turn also, as they naturally will, it may easily happen that a gun will have a limber behind it which does not belong to it. We can well understand the French

anxiety on this point, therefore, but are furnished with an additional argument against their system.

The French regulations insist on the position behind the crest, and forbid an officer to place himself on the top, and yet it must sometimes be necessary to do this in order to get a clear view to the front, and in order to determine whether there are any spaces in the neighbourhood not to be swept by fire. If a regulation such as this were to be rigidly insisted on, it would be necessary to provide the batteries with some special escort which would render them secure against a sudden attack of hostile infantry or cavalry.

Dogmatism on such a point is, I think, to be deprecated, for a battery must be able to overlook the ground close to its target, and should also have a clear view over its own front. In other words, it must be able to develop its offensive powers to the fullest extent, but at the same time strive for as much cover and concealment as possible.

During the exercises at Châlons it was found that, when the background was a dark one, it was very difficult to determine the position of a battery. Under such circumstances a position actually on the crest has less dangerous consequences than one would at first suppose, more especially so since the enemy is not able to observe where his shells fall beyond the target, and therefore his getting the range correctly becomes a matter of difficulty. It was found, too, that a position along the edge of a wood was a very favourable one when smokeless powder was in use.

The Reconnaissance of the First Fire Position.

The reconnaissance of the first fire position was carried out with great caution, yet thoroughly and rapidly performed. Rapidity, the French consider, will usually indeed be here of the first importance, but caution is insisted on, so that the attention of the enemy may not be attracted; and the sudden appearance of the guns will add immensely to their efficiency. Thoroughness is essential, so that as the batteries arrive they may be allotted their positions at once, and that neither confusion nor delay may supervene, either as regards their movements or the opening of fire by them.

This reconnaissance is always carried out by as few persons as possible, who must also, as far as may be, keep themselves concealed. Staff officers and orderlies are left behind the height, and, if time be available, the work is done on foot. Every commander of a unit, that is to say, officers commanding the divisional artillery, the corps artillery, groups, and batteries, took part in this reconnaissance, but each did so with a different object in view. The officer commanding divisional or corps artillery chiefly paid attention to the position which the enemy held, and the stretch of ground that was to be occupied by his groups. He then sent for and informed the group commanders as to the portion of the enemy's line which was to be fired upon by their batteries, and divided the space available for the deployment of guns amongst them. Both these points must be

clearly dealt with, otherwise the first batteries which arrive on the scene will not only at once seize upon the most visible portions of the hostile array for their targets, but will take up their positions without considering whether or not they are leaving sufficient room for those who are following behind them.

Usually it was only necessary for the colonel to show himself, and this will not be of much importance, as the presence of only a single horseman on the crest will scarcely be likely to attract the enemy's attention. The group commander now made his reconnaissance with the same ends in view as had the colonel. He pointed out to each of his battery leaders the target allotted to him, and the position assigned to his battery.

But his reconnaissance must be a more thorough one than the colonel's, because, in the event of the crest line of the height not being at right angles to the line of fire, he will have to explain to his battery leaders whether the fronts of their batteries are to be parallel to the crest line, and their guns therefore to stand in *échelon*, or whether at right angles to the line of fire, in which case the batteries would have to stand in *échelon* with one flank resting on the crest line. He is instructed either to judge the range as best he can, or to gauge it by means of the telemeter. Experience showed that the process of ranging was thus greatly facilitated, and that an effective fire was sooner opened. Finally, the group commander indicated where the *échelons de combat* were to be placed. It is only when he has perfectly made up his mind with regard to all these points that he will give his orders to the battery leaders. Also he has to notify to them the different roads that lead to or from the position, any ground which will be unswept by fire that may lie either in its front or on its flanks, and also the means which he proposes to use in order to guard against surprise. He puts himself into communication with any troops in his neighbourhood, and assures himself that their support will be forthcoming, should it be needed. Above all, too, he must take note how it will be possible to move into a fresh position either to the front or rear without attracting the enemy's attention.

The commander of the battery must make his reconnaissance on foot, and therefore he and those he has with him dismounted behind the crest line. This is necessary so that he may remain, if possible, unseen by the enemy, and he was told to lay down approximately the alignment of the guns (crouching while doing so), so that there should be no need to move them when unlimbered and thus delay the opening of fire. Experience showed that it was advisable to indicate to section leaders, or even to gun captains, if not the actual position of each gun, at least those of the flank guns of the battery, and also to let them know what interval between the pieces was to be allowed. Lastly, the captain is advised to mark in the centre of the battery the direction of the line of fire. The French regulations leave it to him to decide how many and whom he will take with him when making this reconnaissance. On the one hand, it is desirable to take away from the guns as few as possible; on the other hand, it

is advantageous that the captain should personally give the necessary directions as to what is to be done when the guns are unlimbered to as many as can be spared.

When the first fire position is taken up, it is thought most desirable to keep the enemy as long as possible in doubt as to its true situation and extent, so that the fire which is to be poured upon him may be not only effective, but somewhat in the nature of a surprise. Careful and methodical preparations are desirable, therefore, because thus moral as well as material effect may be secured. But no hard-and-fast rules can be laid down. Everything must depend on circumstances, such as the nature of the country, the state of the weather, and the character of the enemy.

There is one principle, however, which must never be lost sight of. *Rapidity is of as much importance as thoroughness in carrying out these duties.* We also learn that, although the country in the neighbourhood of Châlons was very favourable to rapid movement, excessive haste in getting into position was on the whole a mistake; and that batteries which seemed slow about unlimbering, because they acted with judgment, often opened fire in the end sooner than those which moved up at a rapid pace and unlimbered precipitately. It was thought a pity that the French regulations have forbidden batteries to come into action at a walk. It is certain that they must usually do so on the field of battle, and parade movements would therefore seem to have met with favour at the expense of what the exigencies of war demand. An absence of excitement amongst men and horses, and steadiness during the advance and when pulling up, facilitate the opening of fire more than rapid movement.

As regards this point, it is noteworthy that of late the French views have greatly altered; for during the exercises of 1884 great importance was attached to rapidity of movement when moving into position, and no one seemed to raise his voice against it.

Whether the captain of the battery should ride back, when all is ready, to bring the battery on, or whether he should send to the next senior officer to do so, is not strictly laid down, and must depend on circumstances. The best formation to be adopted must also depend on circumstances, and here experience will teach us much. What is essential is that the unlimbering should be done rapidly, and yet in an orderly and regular manner. As soon as the guns open fire the limbers may be sent away to get under cover. It is, however, stated that the order for this must come from the officer commanding the artillery, because it is for him to decide whether this step is advisable under the circumstances or not.

The French consider that sending away the limbers leaves the battery immobile, and under certain circumstances there is an element of danger in its being so. They also consider that to send away the teams of the ammunition wagons is a very doubtful proceeding.

If the wagons are left horsed, the inconveniences which may arise from having the limbers at a distance are at least somewhat reduced. In the event of a successful attack by cavalry, for example, it might be possible for the limbers and wagons to retire into safety. The

enemy can do little harm to the guns, and will neither be able to carry them off nor to utilize them if both teams and ammunition have vanished.

These ideas are duly weighed by a German critic, whose views on these manœuvres I have had an opportunity of reading, and he considers that on the whole the advantages of removing the teams from the wagons outweigh the objections to doing so, especially as the alleged inconvenience and danger are not often likely to be met with.

I imagine that most of us will agree with this view, and that the exposure of the teams will not be made up for usually by any of the advantages suggested by the French officer.

The *échelons de combat* were usually placed on the flank and somewhat in rear of the group. Such a position is quite satisfactory usually, even if the renewal of ammunition by the battery on the other flank is rendered somewhat inconvenient, as its wagons will have to make a flank march over a space of ground covered by the enemy's fire in order to reach the supply. But the spaces between the artillery groups may be needed by the other arms, and are useful to what may be termed the auxiliary services of an army. Wagons placed there may, therefore, be rather in the way, and it is the opinion of Colonel Cohadon that they would be so. The absence of the other arms from the manœuvres is to be regretted, as had they been present light might have been thrown on this question.

A covered position in rear of the centre of the group would seem a preferable one.

Ranging was left entirely in the hands of the battery commander. In fact there was, properly speaking, no such thing as firing by groups. According to the French regulations the group commander is not to interfere in the ranging process, and is to content himself with indicating the estimated range and the target, and with giving the necessary orders for the opening and continuation of the fire.

As soon as several batteries began to fire simultaneously, ranging was found to be impossible, unless each battery devoted its attention to a special target. The French think that every battery, therefore, must have a particular portion of the hostile line assigned to it as its peculiar care. And this is so not only because of considerations as regards finding the range, but also because it is desirable that no battery of the enemy's artillery should be left to bring its fire to bear undisturbed.

Comparing the system of 1884 with that which is here described, we see that ideas have altered considerably. At that time it was regarded as a principle that all the batteries of a group should concentrate their fire on one target. Then too it was declared to be the duty of the group commander to direct the ranging process, and to promulgate to his batteries what ranges they were to continue to fire at.

This part of the subject is one which, in view of what has recently been written on the subject, must largely interest gunners. I believe myself that, even when you have a more numerous artillery, concentrating on one target will be the quickest and surest road to victory.

That is the German official view, and it is based on their experiences in 1870. Nevertheless, modern shrapnel and the projectile of 1870 are widely different in their effect, and he will be a bold man who will dogmatize till we have reliable data from the battlefield to guide us. One shrapnel that bursts correctly is enough to wipe out a whole subdivision. A risk alike very dangerous and unnecessary may, therefore, be involved in a too ambitious policy.

If difficulties and delays in finding the range became unusually great, resort was made to the *tir progressif*, because it is both simpler and promises good results more quickly. The method of "*tir progressif*" consists in a distribution of fire as regards depth, each gun, section, or battery using a different elevation from its neighbour. In spite of its obvious disadvantages, it seems to me that in certain situations, as for example where the ground behind the target cannot be seen, or where the target itself may be almost invisible, better results might be obtained through it than by adhering to a system which depends on correct observation of each round. At the same time we must not forget that with it the expenditure of ammunition is more considerable than when the more orthodox method of ranging is followed.

The group commander when directing the fire of his guns is advised to pay attention to the following considerations:—

Speaking generally, a battery can cannonade with sufficient effect a space equal in breadth to its own front. The French theory is that if you are opposed to an enemy who is stronger than you are, the best way is to engage the whole of his front with a portion of your batteries, and then to concentrate an unexpected fire from the remainder upon successively selected points of his line in order to quickly subdue the fire from thence. These "rafales," or "squalls," however, to use the nomenclature which Colonel Langlois, the distinguished French artillerist, has invented to describe a sudden and overpowering storm of artillery fire, demand a great expenditure of ammunition, and, therefore, the group commander must ever be watchful to see that his batteries get an early reinforcement in ammunition, and that the supply is kept up continuously.

The duty of seeing that the group receives its due supplies of ammunition falls in fact to the group commander, and, therefore, Colonel Cohadon contends that it will be better for the future to unite the three *échelons de combat* belonging to the batteries into one combined *échelon de combat* for the entire group, which would be under the control of its commander.

In the early stages of the fight, the hostile artillery was the target almost invariably fired upon. A change of target was, except under special circumstances, never resorted to except by the order of the group commander. It took a considerable time to effect such a change, owing, it is said, to the difficulty in getting the new direction, or more probably, as the German critic suggests, because of the time which it takes to make a number of people, such as battery leaders, section commanders, layers, &c., thoroughly understand what the new target is to be, unless it happens to stand out very clearly, and is well defined.

The Advance into the Second Position.

The movement out of the first position is carried out by the orders of the group leader, who acts under the direction of the officer commanding the artillery of the division or corps. The advance must be carried out quietly and circumspectly so as to avoid attracting the enemy's attention, and for this reason guns should not be limbered up to the front.

If the enemy's artillery fire has not been subdued it will be best to limber up behind the height, and, if the nature of the country permit of it, and there is no need to make a rapid movement, it will be best to follow the line of the crest as long as possible, and to advance in column of sections, or perhaps column of route, advantage always being taken of any concealment that the configuration of the ground may afford. If on the other hand no cover can be obtained, or when time is pressing, it will be wisest to move at once directly to the front over the top of the crest. But even in that case it will be sometimes more advantageous to limber up in rear of it. Such an advance should be made in line at full intervals as rapidly as possible.

The *échelon de combat* which may have observed the movement of the group, or to which notification has been sent, follows it in similar formation and at the same pace.

Movements on the battlefield must be as rapid and as much under cover as possible, except those to the rear, which are to be at a walk until the first line of the infantry has been passed. The observations as regards caution and absence of excitement on entering a position apply to the second as well as the first.

The Reconnaissance of the Second Position.

Under this heading are included all positions subsequent to that one where the artillery duel was commenced. In these cases the reconnaissances must be made while the forward movement of the battery is in progress, and no preliminary position can usually be taken up. The group leader must hurry on ahead to the new ground, where the colonel will await him. He must rapidly survey his objectives, and the space he has to occupy, and gauge the distance of the former if possible. A sharp look-out for any ground unswept by fire in the neighbourhood should be kept, so that the necessary protection may be sought for from the nearest troops.

The utmost must be made of the short time at disposal, but there should be no undue hurry.

Battery commanders must similarly move ahead of their guns to receive from their group leaders the necessary orders, and make suitable arrangements.

The tactical situation must chiefly influence the choice of the second position; it will often be impossible to turn cover to account, nor can the advantage of surprise be reckoned on, because the enemy can usually judge from the lie of the ground where batteries will unlimber.

Courage will, therefore, here avail more than cunning, and the first consideration must be so to place the guns that they may see clearly and have a fair field for their fire.

As regards fire direction, we are told that if the captain of the battery cannot observe the effect of his rounds, and does not trust the estimated range, he must fall back on the *tir progressif* already alluded to.

The Preparation for the Infantry Attack.

The work of the artillery is now about to culminate, for we must never forget that all that has as yet been accomplished has been but the means to an end. The hostile guns have been engaged in the interests rather of the infantry than of the artillery. We gunners cannot effectually help our comrades till we have rendered the arm most capable of fire effect at least partially innocuous. It is for this reason, and not to fight for its own hand, that artillery enters on its duel, determined to carry it through *à l'outrance*, and the artillery leader, while he is fighting out his own battle, ever keeps his eye fixed beyond it, and while wrestling with the enemy remembers to keep a hand free to aid his friend. Napoleon, who may be taken as the greatest exponent of artillery tactics, understood the phase of the battle we are now about to deal with well. "It is the artillery of my Guard," he said, "that has gained the majority of my battles." And how was this great engine usually brought to bear? Wagram, Lützen, Hanau, Dresden, all tell much the same story, and no one has more neatly and tersely epitomized the tale than Napoleon's conqueror in the brief, curt language of which he was a master. He perfectly grasped his opponent's tactics, and he met them effectually according to his own method.

This is the description he gave in a conversation at Strathfieldsaye in 1837 of what usually occurred:—

"We talked of Napoleon's manœuvre, by which he decided so many of his battles. The Duke said: 'He commenced with a pretty general firing, that you might not know from whence the attack was to proceed, then he brought forward a battery of 100 or 150 pieces of cannon, and when that had swept away the troops opposed to it he poured a large force into the chasm.' This the Duke said he had practised with success against every other nation. It did not succeed with us. 'At Waterloo,' he said, 'he played off his 100 pieces of cannon, we did not care for his 100 pieces of cannon, we did not return a shot; we showed no troops, no person appeared but myself and a few officers. I kept my men behind the crest of the hill, most of them lying down. When the French had made their charges of artillery, their troops marched up the hill; then my men showed themselves; the French found no chasm. We repulsed them; and so again and again; at last when our squares had repulsed their cavalry, and they got into some disorder, we brought forward our cavalry, charged, and drove them.'"

This is a somewhat highly flavoured and crude description of

Waterloo, but in any case much has changed since 1815, and, remember, the French artillery fire brought us perilously near defeat at that battle. Nowadays the lines of fight are more extended than formerly, and while the increased range of guns has rendered the old advance to close ranges unnecessary, the strides in modern musketry have made it impossible. Nevertheless, the breach for the infantry must again be made, but, in place of a rapid advance at the critical moment, there must be a sudden and simultaneous change of target by the guns.

From this second position we are now dealing with the artillery duel will be brought to a conclusion, but then every effort must be made by the gunners to prepare the way for the infantry assault. The Commander-in-Chief must make up his mind during the early phases of the battle where he means to make his stroke. As soon as he is clear on the subject, he will tell the officer commanding the artillery, and point out the selected spot. He in turn will notify it to his subordinates, so that, while they are still locked in the struggle with the enemy's artillery, they may think out and decide upon their plan of action.

The French call this last supreme effort of the artillery the *feu de concentration*. The range, they think, at which it is to be poured in should be a short one, some 1,500 metres. To produce a maximum effect, this fire must burst suddenly upon the enemy, and it must from the very first be of overpowering force. The foe must be allowed no time to take measures in reply, to strengthen the defence, or to organize a counter-attack. To bring about such a state of things, it is clear that the hostile guns must first be so hammered that it is possible to ignore them. No changes of position must give the enemy a clue as to what is coming, but the fire must, as it were, be "switched on" to the selected point, without a hint of warning. It is certain that, to carry out such a scheme effectively, a high degree of fire discipline and training will be demanded.

In the first place the officer commanding the army corps which is to undertake the attack of a decisive point gives directions as to how much of his artillery is to be employed to cover a flank, or guard the field of operations in general. All the remainder will be available for the chief work in hand, and, if their second positions be well chosen, they will usually all be able to co-operate. The batteries must, therefore, be directed from the very commencement of the action with the great end in view. If there are not enough to effect the desired object, the Commander-in-Chief must be asked for reinforcements.

A certain side issue as to whether a reserve of guns should not be held in hand is here presented to us, but I do not propose to enter into it, and shall merely say that, come from where they may, these additional batteries must be informed early in the day that they will be required, so that they may be enabled to open fire simultaneously with the rest. Their movement must be made under cover as far as may be, and room in the artillery line must be left for them, to do which it will sometimes be necessary to reduce intervals. In certain

favourable situations these reinforcing batteries may fire from positions in rear over the heads of those in front. In no case, however, do the French allow these guns to be inserted between those of batteries already in position.

The artillery commander places himself with that group from which he can most easily observe and direct the fire. He will be informed when the *feu de concentration* is to commence, and will start it by signal to the group commanders. They should be prepared for this decisive moment, either by timely warning or by being able to judge from the general progress of the engagement when it is about to occur, and should act on the signal without delay or hesitation. Colonel Cohadon recommends batteries to fire salvos now. He says that the effect of a salvo can at this juncture be more easily judged, and that if the range be not accurate, correction can be made. Moreover, their effect is greater against material obstacles than is that of single guns. The German critic here makes a note of dissent, and, I think, many of us will also view this statement as a somewhat venturesome one. An opinion, however, which is based on experience is entitled to our fullest respect.

Percussion fuzes were at first used, and, a fair approach to the range being regarded as more important than great nicety, we are told that three salvos ought to be enough for the ranging process.

We must remember that the batteries are now in positions which they have occupied for some time, and that, therefore, distances have already been pretty accurately gauged. After the preliminary salvos, recourse was had to time fuzes, but, if there are buildings or other cover to be cannonaded, percussion fuzes and sometimes common shells must continue to be used. But once the storm is fairly let loose, there must be no lull or intermission in it until the desired effect has been produced, and till then the infantry must be held back.

When the crisis has come and the assault is launched, every battery must pour in its fire with redoubled energy, and the foe must be paralysed just as the infantry rush upon him.

At the camp at Châlons this system of delivering a *feu de concentration* was several times carried out, and the experiences recorded are somewhat as follows:—

The commander of the divisional or corps artillery, as the case might be, was informed beforehand what groups were required to prepare for the assault; the point of attack was as nearly as possible also communicated to him; and the time too when it would take place was approximately stated. This usually corresponded to the moment when the infantry arrived at their principal fire position.

The artillery leader then divided the portion of the hostile line which was to be cannonaded amongst the several groups. The group commanders in turn judged by reference to a map, or from the knowledge they had picked up during the course of the engagement, what range each of their batteries might assume to start with. If necessary they were aided in their conclusions by the firing of a few rounds, but the important thing was not to underrate the distance. In

addition, they instructed their batteries as to how the fire of each was to be distributed as regards depth.

They were careful to note whether batteries could fire on the targets allotted to them from the positions which they were occupying, and, if not, their positions were slightly altered to enable them to do so.

Battery commanders then showed the section leaders the points they were to lay upon, and the same point was given to all the guns of the battery. The section leaders similarly instructed their layers.

The leader of the group which was placed nearest to the infantry who were to make the attack, at the hour given him by the commander of the troops fired three battery salvos rapidly one after the other with percussion fuzes, and this was the signal for the preparatory fire of the artillery to commence.

We are informed that good results were usually arrived at during this portion of the practice. Yet it is to be noted that mistakes sometimes occurred owing to salvos which were fired during the artillery duel being mistaken for the preconcerted signal.

Batteries accompanying the Assault.

The "Instruction pour l'Emploi de l'Artillerie" lays it down that single batteries from the divisional or even from the corps artillery are to accompany the advance of the infantry. It was not possible to carry out this manœuvre at the camp at Châlons, and in any case the occasions on which the necessity for it will arise must only exceptionally occur, and even then but small advantages will usually accrue. At the short ranges involved, musketry fire will be so deadly that batteries would be in a fair way to be destroyed ere they could fire a single round. Nevertheless, should the sacrifice be demanded of them, guns must never hesitate to accept it.

In preference to such an advance, however, another manœuvre was executed which it is believed will lead to the best results. This was when a brigade division of horse artillery was sent forward as rapidly as possible from a flank to occupy the position which had been captured by the infantry.

By judicious combination it was so arranged that this movement should take place just as the infantry were making their rush, and, since the batteries only enter the effective zone of musketry at a moment when its intensity will be somewhat subdued, it is considered that the manœuvre is by no means an impracticable one. These horse artillery batteries, on account of the celerity with which they can move, will reach the ground they are making for quite soon enough to repel any hostile counter-attack.

Ammunition Supply.

Some very interesting experiments were made connected with the question of the replenishment of ammunition from the ammunition columns to the *échelons de combat*.

When the batteries were in their fire positions, the ammunition columns took up the places assigned to them by the Regulations, that is, 5 km. (rather more than 3 miles) in rear of the firing line, and established connection by means of orderlies (*agents de liaison*) with the *groupes* (brigade divisions). As soon as three wagons (or, in the case of horse artillery, two) were empty, the orderly led up to the front a similar number of full ones, and placed them beside those which were empty. The ammunition was then shifted from one to the other, and the wagons when emptied were again sent back to the columns. If the projectiles and cartridges were left in the receptacles which contain them, only two or three (according to another account I have received, only one or two) minutes were required for the change, but if they were taken out separately the operation took 10 minutes.

This method appears to me a clumsy one, and by no means so good as ours, by which one wagon is simply exchanged for another, but from private letters which I have received I am informed that French officers have found the slight delay involved of no great importance, and that they think their system has great advantages in respect of preservation of order in the battle units, and in accounting for the amount of ammunition which has been consumed.

The German critic says, with reference to this point, that the German Regulations lay it down that empty wagons are to return to the ammunition columns to be refilled. He says it would seem that the French method, by which the supply is sent forward from the rear, is a preferable one, since thus greater rapidity is arrived at, and the labour thrown on the troops in the fighting line somewhat lessened.

Such is a brief account of manœuvres which I am assured were of the greatest benefit to the French army. I must apologize for having introduced so many technical matters here, but I am, I believe, not singular in thinking that the more we let the army in general hear of the inner working of our arm, the more advantageous will it be, not only for ourselves, but for the rest of the Service too.

Conclusion.

In conclusion let me add that I hope enough has been said to show that there are many questions connected with the handling of artillery which will never be satisfactorily disposed of till we have had some experience under circumstances such as I have described. In dealing with them, a fear of encroaching too far on your patience, and of making a somewhat technical subject still more dry, has prevented me from referring to several points connected with the minor tactics of artillery that need attention. Such details are more fitly discussed in an assemblage composed of artillery officers alone, but many of the principles touched upon may be appreciated by all soldiers, and one or two features stand out so unmistakably from

the rest that I need offer no apology for dwelling a moment longer upon them.

In the first place no one can fail to be struck with the manner in which the note of due method and foresight is again and again sounded.

Artillery, I am afraid we must admit, has sometimes been looked upon as an encumbrance by the rest of the army. Frederick undoubtedly so regarded it in the earlier part of his career. Even up to the Crimean epoch the feeling existed with us. A lack of mobility has always been the cause of this, and has hampered our arm, however ready and willing gunners and officers may have shown themselves. And now some who have listened to what may seem the pedantically careful methods that we must adopt in coming into action may imagine that the guns will have to be waited for again as in the old days when the detachments walked beside them or even drew them by hand. I can assure officers of the other arms that such fears are groundless, and that at the proper moment guns will, I hope, be equal both to rapidity of movement and of fire. But there is no royal road to an effective fire in the face of a powerful adversary, and we shall in the end get on quicker if we are careful at the beginning.

Moreover, care and foresight do not necessarily mean delay where everyone knows exactly what he has to do, and how to set about it. But such knowledge implies experience and training. No man, however well he may pass a paper examination, can handle a battalion like another who has often had it under his command on the drill ground. So is it with artillery. The very highest qualities in those who direct its operations are required, and will no doubt be forthcoming; but natural aptitude must be improved by experience; and we are singularly lacking, even as regards the experience of others, in field artillery matters. The Russo-Turkish War gave us only negative information, and even in 1870, splendid as was the success of the German batteries, and much as we admire their deeds, the results are not completely satisfying; for the German guns were not adequately opposed by their own branch of the service as they will be again. They had always the best of the artillery duel, and were able to do things that perhaps they could hardly venture on in future. Yet do I believe that, however superior their armament was, the German batteries gave us a fine example of what patient study and practice on the drill ground may bring forth, and that they triumphed because their leaders understood and appreciated artillery better than did their opponents. "War is the harvest of peace," and in 1870 was reaped the result of careful preparation and a wise application of previous experiences. We may learn, at least, that lesson. And there is another truth which I believe we must also accept, even if we choose to discard the tactics of the Germans and of Napoleon. There was no doubt a certain prodigality about the manner in which guns were thrown into the fight in 1870. An inequality of armament in one direction demanded it, and in another rendered it possible. We may not in the future be called upon to be so venturesome, we may

not be able in the face of the magazine rifle to make our way forward to the same extent, but assuredly we shall have to fight in masses, and the vast batteries of Woerth, and Vionville, and Gravelotte will again be found on both sides.

For modern science, while it has endowed us richly, also has imposed severer duties with its gifts. The artillery fire of 50 years ago was to that of to-day as is the power of a watering pot to that of a garden hose.

From a central point you can now throw projectiles, if the ground be favourable, where you will. Formerly, when ranges were short, guns, to come into action at all, had to be distributed, and to produce a great effect a reserve of them had to be held in hand till they were needed. All the guns of an army were rarely or never therefore in action together. The proportion they bore to the other arms, too, was smaller than to-day, when improved manufacture has added so greatly to their value. When guns can make themselves felt, as they now can, from the earliest moment, it is an error to let any stand idle. But the guns of a modern army corps will occupy so much space that, to make room for the other arms, they must be concentrated; and therefore I say that, even if we were disposed to deny (which we are not) that concentration of fire (to be obtained only by concentrating guns) is desirable, we will be driven by necessity to combine our batteries.

What was once a question of tactics is now, therefore, a matter of necessity. And as the numbers of guns increase, so do the troubles of those who would direct them grow.

1. The heavy fire interferes with the issue and understanding of orders.

2. It is hard to ensure good practice, because it is not easy to distinguish one's own shells from those of a neighbouring battery.

3. Experience has shown that it is difficult to get certain distant batteries to cease firing just at the right moment, when the infantry are closing on the enemy's position.

To overcome all these obstacles a sound and uniform system of direction is necessary, and if we do not work out our task successfully it must not be forgotten that we check rather than assist the rest of the army. Even with comparatively small numbers the task set us is not light, but when the corps artillery has become amalgamated with the divisional batteries it becomes so exceedingly arduous that I submit it is not fair to ask men to wait until they are actually on the battlefield ere they try their hands at it.

Another consideration which impressed itself much on me when I studied the experiences at Châlons, and which I think will probably have attracted notice from many who have listened to this paper, is the largely-increased proportion of field artillery that Continental armies are likely to bring into the field in future. Germany and France possess the best organized armies of the day, and we may take it that it is their example which will be followed by other nations.

Now, in 1870 France had 72 guns to 39 battalions in an army

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corps, and Germany 84 guns to 25.¹ Since then both France and Germany have raised the number of their guns to 120, and France has reduced her infantry to 25 battalions.

We, on the other hand, have increased our infantry from 21 to 25 battalions, and reduced our guns from 90 to 84. Matters, in fact, stand at present thus:—

	No. of battalions.	Strength in rifles.	Squadrons.	Guns.	Proportion of guns.
Great Britain....	25	24,000	4	84	3·5
France.....	25	23,700	8	120	5·0
Germany.....	25	24,000	8	120	5·0

I am most willing to admit that our infantry is the best in the world; but I would ask, in some doubt I confess, as to whether it is so much the best that it can with confidence dispense with the assistance of artillery. For I have said that ere the artillery can effectually prepare the way for their comrades, they must subdue the fire of the hostile guns. Proud as I am of the regiment to which I have the honour to belong, I must fall back on a becoming modesty when called upon to speak of what it can accomplish. I will leave the question, therefore, as to whether 84 British guns can confidently aspire to subdue the fire of 120 foreign ones in abeyance, but can assure you sincerely that I preserve a laudably open mind on the subject; and I resign the question of the proportion of guns to other troops the more readily to a mixed assemblage, because it is a matter which affects the other arms more than it does our own. If guns be

¹ According to a paper published in the "Militär-Wochenblatt," of the 8th of April, 1893, the organization of the German corps in 1870 was as follows:—

	Battalions.	Squadrons.	Guns.
Guard Corps	29	32	90
1 Army corps.....	25	8	84
2	25	8	84
3	25	8	84
4	25	8	84
5	25	8	84
6	25	8	84
7	25	8	84
8	25	8	90
9	23	12	90
10	25	8	84
11	25	8	84
12	29	24	96
17 infantry division	13	12	36
Total.....	344	160	1,158

placed judiciously, and the ground be favourable, it is possible that they may escape annihilation, or even severe loss, at the hands of a foe overpoweringly strong, that is, provided they do not attempt to advance from their position. But artillery does not exist to fight its own battle. No artillery worthy of the name has ever done so, and batteries that have not strained every nerve to co-operate with the other arms have practically effected nothing, even though they may not have been worsted in their struggle with the enemy's guns. It is from no selfish motive, therefore, that I point out our weakness in field artillery. It is in the interests of the battalions advancing to the assault that we would be strong ; it is to aid them that we would exert our strength, and it is because we wish to be able to respond readily, energetically, and effectively to the calls that will be made upon us that we desire an opportunity of developing and perfecting by exercise the powers, even though they be but moderate, of which we are already possessed.

Colonel TYLER : Mr. Chairman and gentlemen, I cannot touch on the many subjects which have been dealt with by the lecturer. To do so would be almost to recite several chapters in the Drill Book. I will, therefore, confine myself to a few. The French evidently attach the highest importance to the study of tactics, and, indeed, while field gunnery is within certain well-known limits an exact science, which can be acquired wherever there is a range, tactics can only be learnt by practice and experience under various circumstances and differing conditions of ground. A perfect knowledge of gunnery is of no value if your knowledge of tactics is so defective that at the supreme moment you bring your guns into a wrong position. Napoleon said, "Fire is everything;" but he always took care that his guns were well placed, and the ranges in those days being short, positions were easier to find than they are now. The French of the present day seem to put it in this way : "Position is everything; without it fire is nothing." A field artilleryman, therefore, must, in addition to his knowledge of gunnery, also possess a good knowledge of tactics. Now to apply that lesson to our own case. We have a Field Artillery School, which is a branch of the School of Gunnery. But the Tactical School is at Aldershot, so that the batteries which have to be taught have two different sets of instructors, and the two schools work independently; indeed, as a matter of fact, you have two sets of masters and one set of pupils, and the two sets of masters have no communication with each other. That does not seem to be a very satisfactory position. The gunnery and tactics of field artillery are inseparable; you cannot touch one without the other. Each movement of the battery until the word "Fire" is given—the march, the choice of position, the service of gun, the supply of ammunition, the position of limbers and wagons, all things that occur in the rear of the gun, and a good many that occur in front as well—all these things are questions of tactics. There is a danger too that when two sets of men are working together independently there will be confusion and probably compromise, and a compromise is always unsatisfactory. If you want simplicity in the field you should avoid complication in the council chamber. I think, therefore, the French, who have the one camp at Châlons—which seems to me to unite Aldershot and Okehampton—are wiser than we are, who have our schools divided and working rather independently of each other. The question of orderlies seems to me a very important one, and one that is quite new to us. I think the system is an excellent one. It is sometimes forgotten when a number of batteries are committed to action against a target or targets, and any change is desired by the commander, that it would be a most difficult operation for him to make known to all the various details below him—the battery commander down to the gun layers—that he wishes to make a change; for when men are committed to firing at a certain point, and have got their whole attention fixed on that point, it is not an easy thing to turn them on

to something totally new, and unless you have messengers who are accustomed to carry details, fuzes, ranges, and targets in their heads, you will find there is a great difficulty in this communication of orders. Therefore I think the French system of orderlies is a very good one. The manner in which concentration is dealt with is very interesting to us at the present time. We have had it lately on high authority that concentration is the whole duty, or nearly the whole duty, of the field artilleryman, and that he has to use that power whenever possible. Now the French do not go nearly as far as that. Their idea seems to be that the weapon of concentration is only to be used at the supreme moment, when range, time, and effect produced are all favourable, and this would never occur, as I understand it, until the action is well advanced, and the range not greater than 1,600 yards. In fact, concentration of field artillery seems in this view to be somewhat akin to the shock tactics of cavalry. The cavalry charge is only made when time and circumstances are all favourable, and concentration is determined on in a similar manner by the French; it is, in fact, the culmination of the artillery attack. Whichever may be the correct view, it is quite certain that the French have passed through a bitter experience of the effects of a superior artillery fire, and, as we may be sure the terrible lesson has not been lost upon them, their deliberate opinion is entitled to great weight. There are many other points, but no doubt other gentlemen will bring them to the front.

Colonel CAREY: I fully concur with the principles laid down in the able lecture that we have just heard. With regard to concentration, which is a most essential object, I look upon it that the power of concentration is a great deal more than the actual concentration of men and masses of artillery. The great objection raised against the massing of artillery must lie in the difficulty of keeping touch with the long line of wagons carrying the ammunition, because let them once get separated from the battery, and they are lost to it for ever. Then, as to the 84 guns to an army corps, that Major May lays down as too small to resist 120 guns, there is no doubt an officer would be next door to mad if he were to advance 84 guns in line against 120 guns brought up in position; but, on the other hand, by skilful manœuvring of his batteries, they might become more than a match for their opponents. One or two batteries might take the opposing guns in flank, or be put in such a position as to be tantamount to being on the flank, and so throw the enemy into confusion, and in such a case the advance of the remaining guns on the direct road would complete the discomfiture. The only thing is, that in order to carry out any such manœuvres, and to move the batteries as required, you must have a good system of orderlies. Great advocate as I am for our gunners being able to shoot straight, still, as I have fully explained before in my letters in 1888, good shooting would be absolutely thrown away and innocuous unless the batteries are well placed. The only means to attain that position is superior tactical power. The British officer must be able to outwit the enemy in the manœuvring of the artillery and the manœuvring of the army. In these days of economy and pensions it is not possible to expect the Government to increase our artillery from 84 guns up to 120 guns to a division (which would mean an addition of 36 guns, or 6 batteries) to enable us to carry out anything like the French system so well described, and India is the only country in which we can do it. The United Kingdom is too small to enable one to get the ground and to shoot over the ground in that way. There is one great essential necessary, without which the artillery would almost surely come to grief, and the army with it, and that is, the general officer must have full confidence in the officer commanding the artillery under him, and treat him with the same confidence as he does his adjutant-general and his quartermaster-general. I regret to say that there are a few officers outside the artillery, and some artillery officers also, who do not understand artillery sufficiently well to work and manœuvre it correctly in connection with the other arms of the Service. They are too apt to consider that guns are guns, and there they are. And also with regard to artillery officers of any rank, it does not matter how junior—he may be only a sub-altern—it is said, "Oh, it is an artillery officer's opinion, and that is sufficient." These things, as I look upon it, are dead against rapidity of action, and unless we are able to overcome these we shall not attain it. If, on the other hand, we could

accomplish that, then our small force of artillery might be a match for any force that could be arrayed against us.¹

Lieutenant-Colonel MARSHALL: There are one or two points I should like to refer to. First of all, as regards the statement that we in England have never had a mass of guns, even a small mass, complete with wagons and ammunition columns. I think it will be of great interest to officers to hear that next week we, for the first time, are going to have something of the sort tried at Aldershot. Sir Evelyn Wood has arranged for an artillery tactical day, with a brigade division on each side, and each brigade division is going to have a complete ammunition column with it. As regards the normal formation for action, which the French appear to have, I cannot but think it is open to great objection. Their system of having the limber and wagon both placed immediately behind the gun, and a good distance between each (making a target of about 60 yds. depth), must be open to objection. It seems curious that with their great anxiety to keep up their mobility they should adopt such a method. I think every one agrees with the system that we are now inculcating, namely, that the best plan is to keep the gun limber ammunition and the gun teams intact as long as possible, and I cannot see the object of, from the very first, exposing them. As regards the orderlies (*agents de liaison*), we all seem to be agreed that the system is excellent; but I should like also to say that the same system holds good as regards the other arms of the service. An officer who attended the manoeuvres last year told me that he was greatly impressed with this *liaison* system. They not only had it in the artillery, but in every unit, and it is used on every parade. When any unit parades for any drill there is a *liaison* ready, and permanently detailed. The moment a squadron, for instance, is detached from the regiment, without any further arrangement or the Commanding officer taking any trouble about it, the squadron *liaison* falls out and attaches himself to the Commanding officer of the regiment. The same applies to batteries and to other arms, and it acts in a most excellent manner, I am told, and I think it would be worthy of our imitation. With regard to concentration of fire, there seems to be some sort of confusion about concentration in *ranging* and concentration *afterwards*. It must be evident to every officer who has ranged even a single battery, that it is exceedingly difficult to concentrate during ranging, and I do not think anybody who is an advocate of concentration would advocate concentration whilst ranging.

Major A. M. MURRAY: Major May has given us a great deal of valuable information about French artillery tactics, but I should like to ask if he can still further inform us on one or two points which are not perfectly clear. As regards the functions of that large staff of officers detailed for a regiment of French artillery, could we be told how they are disposed of, and what are their functions? It seems to me that, with the French artillery, the number of officers outside the battery establishments is very much larger in proportion than the corresponding number in the English artillery. Our own group leader, our own brigade-division commander, has absolutely no one to help him at all outside the battery establishments. Every officer, every orderly, every trumpeter, has to come from the ranks of the batteries. Then, how do batteries in the French artillery move into position? Do they move simultaneously and independently under the orders of the group commander? or do they move into position under the direct executive personal command of the group leader; that is to say, does he lead them with his own hand and with his own voice?² Some of us will be very glad indeed to see that

¹ Let us learn practical as well as theoretical tactics with what we artillerymen have, and we may do a great deal more than appearances warrant. When the great crisis comes, the Government will by force of circumstances be obliged to increase the artillery of a division according to the nature of the country in which the army is working, but until then the artillery must be satisfied to make the best of what they have.—W. C.

² The point is important, because our system of training and, to a large extent, our drill formations depend upon how it is settled. If batteries move as separate units independently and simultaneously (the brigade-division commander acting as brigadier), then we want little or no precise drill above the battery. We can eliminate from our drill book all those "elegant" brigade-division moves which

the French have adopted the system of preparatory positions. They do not merely recommend this system, but they have officially adopted it, and ordered it to be practised constantly during manœuvres. The system is not in favour, I know, in our own artillery. It was tried at Aldershot in 1890 and 1891, but last year, I believe, it was abandoned. The batteries are again taught to gallop straight into action without any previous reconnoitring of a position. I think myself, as a battery commander, that it is an immense advantage to be able to halt the battery, if for a few moments only, under cover before it is brought up into the firing position. Cavalry and artillery fighting are quite different. You want a cavalry soldier to lose his head, if possible, when charging, but you want a gunner and driver to keep their heads very clear indeed when going into action, so that the sights may be properly adjusted and the fuzes properly fixed. I think that the few minutes we used to get two years ago—it is not allowed now—the few minutes we kept under cover before we advanced into position were most valuable in order to steady both the men and horses, and give them breathing time.

Colonel TYLER : No alteration whatever has been made in that.

Major MURRAY : I am going by the provisional amendments to our Field Artillery Drill Book, issued last year. They do not once mention the preparatory position at all. With regard to the matter of massing the wagons of the brigade-division under one officer, we are probably all agreed upon that point. It is the thin end of the wedge of centralization, and all who really believe—and some of us do—in the principles of decentralization, naturally raise their voices when they see the cloven hoof of centralization coming out. I do not think any English artillery officer would be disposed to agree with Colonel Cohadon in this matter.¹ I would only venture to hope that our new Drill Book will breathe some of the spirit of this lecture, and, as we have accepted the Continental system of fire discipline, so we may also accept these new principles of tactics, and that we shall follow in that path of tactical progress along which our French friends and allies have so well shown us the way.

Captain HEADLAM : I wish to say a few words upon some points of detail with reference to the French regulations for the formation of batteries in action as compared with our own. It struck me, as it did Colonel Marshall, and I dare say several others, what an enormous target the French battery must be, with its limbers drawn up almost 50 yards in the rear of their guns. It seems to be about the worst formation that you could possibly adopt. Now, I think, ours is very much better in this respect; but the lecturer has told us that the French regulations lay down that when the limbers are taken away from the batteries, they must not be taken more than 250 m. When Colonel Yeatman-Biggs brought out the scheme adopted in India, the limbers were placed 250 yds. away from the guns, that being a sufficient space to prevent a shell having effect both on the line of guns and on the line of limbers. This has been altered lately, with the idea of simplifying the formation of the battery by combining the second line of wagons and limbers. Unfortunately, I think, the limbers have been sent back to the wagons, and they are now, as it is laid down, between 400 and 800 yds. in rear of their guns. That you will see admits of the line of limbers being practically half-a-mile away from their batteries. I think that is a very dangerous formation when you have a large number of guns in action. If an order suddenly came for a brigade-division or battery to be moved, it would take a long time for that order to be sent back half-a-mile to the limbers, and then for them to get up to the guns. It would also involve considerable expenditure in horseflesh, while if they are only 250 yds. in

Prince Kraft regards with such contempt. The whole of the time given up to practising these movements can be devoted to training batteries to manœuvre under the direction of the brigade-division commander by means of "agents de liaison." If, on the contrary, the brigade-division of three batteries is to move into position as a big tactical unit personally commanded by the hand and voice of the brigade-division leader, then a great deal of precise drill will be required to enable the commander to gain the necessary drill control over his batteries.—A. M. M.

¹ Units may get mixed in the course of a battle; but let us, at any rate, start by keeping each unit intact.—A. M. M.

rear, they are quite within touch of the battery commander, and can be brought up by signal. Another point about the drill for the limbers is that, according to our book, directly the battery comes into action, the limbers move to the rear at a trot, without waiting for the wagons to come up. If all goes well, the wagons are up at the same time, but it constantly happens that there is some little delay about the wagons galloping up, and they are not there when the limbers go away. We know that it is very demoralizing, even on the practice ground, for the gun detachment to find themselves left with no wagons, their limbers gaily trotting away to the rear, and no more ammunition than that carried in the portable magazines. I think the limbers should not be allowed to go off by themselves without anybody in charge. They are supposed to be taken over by the quartermaster-sergeant when he meets them with the wagons; but suppose he is not up in time, there are all these limbers trotting away with their young drivers, and nobody in charge. It is possible that the trot might become a gallop simply out of excitement, and I do not think the effect on other troops coming up would be very good; they might not distinguish the fact that it was only the limbers, and that the guns were all in action. If it were laid down that the limbers should halt at their guns until the quartermaster-sergeant came up with the wagons, and then should be marched to the rear by him, it would be a very slight alteration, but I think it would be an improvement. With regard to the orderlies, Colonel Marshall will be pleased to hear that the system he has spoken of was tried with his old battery in India. We had in each section a permanent orderly, or ground scout, and most useful they were. They used to go out on all parades, and in addition to their work as ground scouts, they held officers' horses, went with messages, and did all sorts of odd jobs. When we went to the big cavalry manœuvres they were of the greatest use. Of course we had a large establishment, but I think something might be done in England by utilizing the range-finders, and training them to do this sort of independent work. It requires a little training to teach a man to ride independently, and to use his head when he is sent with a message.

Lieutenant-Colonel BUCHANAN-DUNLOP: There is only one point on which I wish to speak. The French allot to each corps d'armée a brigade of artillery, which is then split up into groups, one being attached to each division. It seems to me that that is going the wrong way to work, because the groups have then to be taken away again from the divisions to form a long line of guns. The cavalry regiment has been taken from the division and the cavalry brigade from the army corps. Does it not seem as if the time had come for the divisional artillery to be treated in a similar manner, and to be all massed into a division by itself? What is the good of divisional artillery? Why not have all the artillery of a corps, however many the guns, under one commander, and if a division has to be detached, let a group of three batteries go with it? There is another point, about nomenclature. Is not the expression "brigade-division" very awkward? Why not call the three batteries which a lieutenant-colonel commands a "brigade," and two or more such brigades a "division"? In our corps organization, too, we have the corps artillery, consisting of three horse artillery, and two field artillery, batteries. The consequence is, the corps commander very often says, "Take the corps artillery, put them into line, and begin the action." That is to say, horse artillery batteries being lumped with field artillery have to be armed in the same way. I think many officers consider that a mistake. Horse artillery would seldom have to come into action at such long ranges as field artillery, and therefore might be armed with a lighter gun, one that would not range so far, and yet with plenty of effect, thereby gaining in mobility, which is their characteristic.

Lieutenant-Colonel GUNTER: The lecturer has told us that the number of guns has been reduced to 84. I would ask him if he could tell us whether 96 is not the correct number now, because, in the latest organization tables that are published, it is said we are to have three batteries of horse artillery, as well as three batteries of field artillery, in the First Army Corps.

Major MAY: According to the information I have, it is 84 guns to an army corps.

Lieutenant-Colonel BUCHANAN-DUNLOP: The corps organization is 84 guns, but the First Army Corps has an excess battery which makes it 90.

The CHAIRMAN (General Chapman): Major May has given us a very careful

review of what our neighbours, the French, do towards training their artillery officers to meet the difficulties which arise in the exercise of high command. All that he has told us points to the great value to be attached, in the present day, to the possession of tactical knowledge by the senior officers of the Royal Artillery. In my own opinion, excepting as regards ground and the number of field guns we can bring together, we are not behind other nations in the means at our disposal for acquiring knowledge. I think the tactical exercises now being carried on at Aldershot represent a high order of training, and lead to the education of all ranks, both of those who take part in them, and of those who may be fortunate enough to look on at them. For my own part, I believe that we possess at Aldershot, Okehampton, Shoeburyness, and at Woolwich, all the requirements of a great school for our field artillery. We want all officers who are responsible for each separate school to share in the general system of education, and to arrange that the largest possible number of officers and men reap the advantages of our gunnery schools. I recognise a great advance in this direction at the present time. Regarding what has been put forward, I think the matters in which we want improvement are, chiefly, "rapidity of fire," and "simultaneousness of fire and appearance." Towards obtaining the first, something may be done by modifying the rules with regard to our competitive practice; the second can only be the result of careful practice and drill. With regard to the main question of the exercise of a large command, I am not inclined to hamper an officer, who may be in command of two or more batteries, by any restrictions. I believe that command is that which requires the closest study from all. I think that the instructions as to the preliminary reconnaissance should be so drawn up as to leave the commander a considerable amount of latitude. I think he need not be required to reconnoitre a position, or to leave his command, at a critical moment. In such matters he should be guided by the circumstances of the moment, and very greatly by the skill of those who are under him. I mean, that his attention must never be released from the command which he exercises. I doubt the possibility of his doing this if he is required to move about too much. I will now ask Major May to reply.

Major MAY: With reference to what Colonel Tyler said as to the value of tactics to artillermen, and the connection that is desirable between technical and tactical instruction, I think we all agree with him; and not only do we all, both artillery and infantry officers, agree with him, but many hold the same views in other countries, as I can assure him from personal knowledge. There is an officer in France, Colonel Langlois, who has written what those of you who have seen it, I have little doubt, will agree with me in describing as one of the fullest, and in many respects most admirable, books on field artillery which has appeared for many years. He has given a great deal of attention to the tactical side of the question, and although he has been for some years Professor of Artillery at the Ecole Supérieure de la Guerre, in Paris, he is so liberal minded, and, in spite of his deep technical research, so little of a bookworm, or pedant, that he can write to me as follows: "The tactical education of artillery is certainly of much greater importance than its technical instruction. We are beginning to understand that here now; but progress is always slow with a certain number of people, because we have to struggle against those timid ones who are afraid of any change, and who are contented to remain as they are in ordinary routine, and against those sceptical persons who do not believe that there will ever be any necessity for any change. In fact, against the people who are naturally idle, and prefer their leisure to striving for something better"; so that I hope Colonel Tyler will feel that many, both here and abroad, sympathize with him and largely share his views. With regard to the orderlies, I think we again are all agreed. It would be most excellent if we could set aside some men and train them to carry messages. Unless a lieutenant-colonel has had an opportunity of getting a few such men together and of teaching them himself, he finds very often a great deal of difficulty in getting messages to the more distant batteries delivered as they should be. Some men are slow in grasping what is meant, in finding those they seek, and in remembering exactly what they were told to say. Colonel Tyler, when he spoke of concentration of fire, seemed to regard it as only desirable when you were preparing or the infantry attack, or at some decisive eventuality of that kind.

Colonel TYLER: I did not give my view; I gave the view I gathered from the lecture.

Major MAY: I felt that I had very likely misunderstood him. As far as I know, what the French feel is that it is a dangerous thing to leave any hostile batteries unfired upon, but they do recognise the value of concentration. I believe in concentration as far as possible, and in the lecture I said that the German official regulations supported the opinion I put forward. But perhaps it would be better if I read you a translation of a few paragraphs of the German "Drill Book," for you can then judge for yourselves how matters stand, and in the brief way I put it I may have given you an idea that the German is opposed to the French view, and that they recommend concentration on all occasions. Whereas, although I think I was right in saying that they regarded concentration as the surest road to victory, they do recognise, as the French do, that it is rather dangerous, considering what a very powerful projectile the shrapnel has now become, to leave a part of the enemy's line absolutely unfired upon. It seems to me that in this question an old principle of tactics is involved. You demonstrate along the whole of your opponent's line, and then pour in a concentrated fire upon a certain portion of it when you get the opportunity; but certainly my idea is that you should always concentrate during the artillery duel if you can, and you must always try to do so, even if you are annihilated in the attempt, on the point selected for the infantry assault. In the earlier stages of the fight it might be different, and if hostile batteries were injuring you, you might not, perhaps could not, afford to leave them unfired upon. And now I will read you what the German Regulations say, p. 151, paragraph No. 307: "Effect will be much enhanced by means of the simultaneous opening of a well-prepared, sudden, and uniformly-directed fire. The concentration of several batteries on one target and an increased rapidity of fire offer the best chance of a quick and decisive result." Paragraph No. 308: "It is usually impossible to avoid distributing fire on several targets in order to avoid leaving individual portions of the enemy quite undisturbed in their endeavour to arrive at an effective fire. But such a distribution must never be allowed to degenerate into an aimless scattering of fire, for a numerical superiority in guns will only reach tangible result when fire is concentrated, in attaining which end crossing of fire is often unavoidable. Even when no numerical superiority exists, an effort must be made by temporarily concentrating guns to produce an overwhelming effect against a part of the enemy." I do not think, therefore, that the German and French views differ so much as you were perhaps led to believe from my lecture. Colonel CAREY spoke of manœuvring power as enabling you to counterbalance numbers or power of guns. I cannot agree with him in this opinion, because I think it is exactly contrary to the teaching of the Franco-Prussian war, and that if there is one thing demonstrated more clearly than another by that campaign, it is that manœuvring will not make up for other deficiencies. There we read that the noticeable difference between the handling of the two artilleries was that the French often changed their position and tried by manœuvring to make up for the inherent weakness of their armament; but it did not pay, and there is no doubt whatever that the German artillery had always very much the best of the fight.

Colonel CAREY: I am afraid, then, the British artillery would look small under similar circumstances.

Major MAY: I dare say we should. Colonel CAREY thinks also that we cannot expect the Government to add so many batteries to an army corps as would bring about an equality. Well, while we have an army corps organization at all, I say that it is in the highest degree rash to legislate for one with only 90 guns, when, if it is ever used, it will probably be opposed to one with 120. If the country understands that we keep up an army corps, they probably imagine, very naturally, that it is better than other foreign army corps, because, having only one, that one ought to be something very select indeed. Whereas the truth is that, if it comes out, with such a great deficiency of artillery as exists, I do not know how it is to oppose a similar foreign unit with any chance of success.

Colonel CAREY: I expect the British army corps will have to resist six foreign army corps.

Major MAY: Then it will meet some very large masses of artillery indeed.

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While on this part of the subject, I would like to state that Sir Charles Dilke, who, as you know, has a great knowledge of the French army, and has written a great deal about our Imperial needs, and has published an account of the French manœuvres last year, hoped to have been here to-day. I feel sure we all regret being deprived of the benefit of hearing his ideas. He has, however, written to me, and he says, "Would it not be well to mention the fact that, although in their special artillery manœuvres the French only mass the artillery of one corps, and that without infantry, in their ordinary manœuvres they have frequently massed a far greater number of guns? I imagine that it would be very difficult in manœuvres, other than those with blank, to handle the guns so as to present the conditions of war. I noticed in my account of the grand manœuvres that the artillery fire was always over the heads of the infantry, and sometimes over several lines of infantry. Obviously there would be a great element of danger in such manœuvres if blank were not used. At the battle of Nargerie, during Saussier's march northward on Vitry, he massed the guns of more than two corps, with a single target—the village of Nargerie itself—and in this case, as in all others, the fire was over the heads of the infantry. Eastern France and Western Germany are rolling countries with any number of artillery positions, but I do not in the least understand how the enormous masses of guns of modern war would be handled in a flat country, as, for example, in the event of a Russian invasion of north-eastern Germany, or of a German invasion of Russia. The French manœuvres are always held in rolling countries, and I cannot remember that they have ever handled any large force since 1870 in the plains of Beauce or the Orléanais." I think that massing guns on flat ground certainly presents a difficult problem, and one that, perhaps, we shall not be able to solve ourselves; but it is a remarkable fact, that at the battle of Wagram, always quoted as one of the greatest instances of guns being massed, the country was perfectly level. The battle was fought on the flat alluvial soil on the banks of the Danube, and a nearer approach to a perfectly level plain could hardly be imagined. It must have been a very difficult matter to mass guns there, because they could not have fired over the heads of troops in front. I am very glad Colonel Marshall mentioned what was going on at Aldershot. I should have liked, if I had had more space, to have compared what the French did and what I knew we were going to do, but I had not room. We have learnt very much of late as to artillery tactics at Aldershot, and now, no doubt, we shall learn something as to ammunition supply too. Major Murray asked about the number of French officers, and how they are disposed of. There are nominally five officers with a field battery, and five with a horse artillery battery, but really there are rather fewer, because the second captain is nearly always away. I believe such a state of things has been heard of elsewhere. There are, therefore, practically, only four doing duty. But they seem to have a very much larger staff than we have. I mentioned the number of officers who composed it in my lecture, and do not know that I can now go into closer detail on the subject, except to say that, as you will have noticed, several of the officers mentioned on that staff belong to departments, such as doctors and veterinary surgeons. Officers in charge of clothing, and employed on such other administrative duties, also appear upon it. Whether the Group Commander leads batteries forward by word of mouth or not must depend a good deal on circumstances. He often could not do so, I think. From what I have seen of our artillery work at Aldershot, the batteries do not now move up in position without the Colonel going on and making a reconnaissance, but they only dwell a short time in a preparatory position. I do not, therefore, think the rule about the preparatory position can have been greatly altered in our artillery. Since, however, we have amongst us an officer of great experience at Aldershot, I think I may appeal to him, and no doubt Colonel Marshall will be able to answer your question in detail.

Lieutenant-Colonel MARSHALL: The rule has been modified, but it has not been abandoned. At one time the preparatory position got too much into vogue. At last it got to such a pitch that you could not move a battery even to go into action on a flat plain without going through the whole process of crawling up and sending everybody forward beforehand. It was not said that the thing was to be a matter of surprise and that there was to be no preparation at all, but the only regula-

tion was that other modes of coming into action are recognised besides the method of occupying a preparatory position. That has not been abandoned, as far as I know.

Major MAY: With regard to what Captain Headlam said about limbers being sent off, I have no doubt the matter has been very well thought out by those who framed the new regulations, and that what is done is done for a very good reason. Of course the object in view is to make as small a target as possible, and to keep the non-combatant part of a battery out of fire. It does certainly seem to me, however, that from 400 to 800 yds. is a long way for limbers to be from their guns. The French insist on their not being more than 250 m. distant. I must say that if you are to have them sometimes 800 yds. away, it does seem a long distance. I presume, however, that that would only be the distance when it was necessary to keep very far back on account of there being no cover; but surely they could usually get cover a great deal nearer.

Lieutenant-Colonel MARSHALL: 600 yds. is the average, from 400 to 800 yds.

Major MAY: Would they never come nearer than 400 yds., supposing that cover were available?

Lieutenant-Colonel MARSHALL: I think that would be more a gunnery question. If it could be settled that they would be safe 250 yds. from the rear—safe from immediate fire—I think the regulation should be altered. I think the idea is that you are safe from immediate fire at 400 yards, but if you are safe at 250 yards, no doubt the distance would be altered.

Major MAY: Colonel Buchanan-Dunlop asked what was the good of divisional artillery. I rather like his suggestion, because I believe it would conduce to handling guns boldly and in masses. It has the advantage of treating the whole artillery as one unit, and sending away from it three batteries to a division, or more when they want them. But, if we are to raise large questions of that sort, I would almost like to put a question to him, and ask, What is the use of corps artillery? If I were going to alter the distribution, I should have simply strong divisional artilleries, because the present corps artillery is not to be held in reserve, and it comes into action practically as soon as the divisional artillery, or even before some of it. Do I understand Colonel Buchanan-Dunlop to advocate an altogether separate artillery unit?

Lieut.-Colonel BUCHANAN-DUNLOP: I would have an artillery division just like a cavalry division.

Major MAY: I think myself such a system would certainly conduce to the use of artillery in masses. Then there would be no difficulty in collecting batteries together. At present, I suppose, an officer commanding a division might be inclined to be cross if his guns were taken away from him and ordered to form a mass. On the other hand, it would somewhat destroy the independence of the division, which is the advantage derived from using the divisional arrangement. The officer commanding the division becomes accustomed to the men commanding the batteries, and they in turn learn to know his ways, and thus the division as a unit works well. There is no doubt, I think, from what we learnt at the very interesting lecture given by Captain Headlam the other day, that the best manner to equip horse artillery is to give it a distinct armament of its own, and the idea that the horse artillery and the field batteries are to have the same guns is not viewed with favour at the present time. In conclusion, I can only say that if there are any other points about which I have not expressed myself sufficiently clearly, I shall be very happy to answer any questions.

The CHAIRMAN: It only remains for me to offer your thanks to Major May for his most interesting and useful lecture.

Friday, May 12, 1893.

GENERAL G. ERSKINE (Chairman of Council) in the Chair.

THE BANQUETING HOUSE, WHITEHALL.

By C. A. HERESHOFF BARTLETT, Esq., LL.B.

THERE are few places in London so intimately associated with the names of great men and with many of the important incidents in their lives as the building standing in Parliament Street, diagonally opposite the Horse Guards, and known as the Banqueting House. Its graceful proportions and perfect construction are living evidences of the skill and thoroughness of its designer and builders.

On this spot, prior to 1619, there stood a wooden structure, known also as the Banqueting House. It had been the scene of many festivities and Royal pageants. It was falling into ruin when, on Tuesday, January 12, 1619, the building caught fire, and in an hour it was entirely consumed. Meanwhile, the crowd which had gathered broke into the rooms of the palace (finding their way into the King's and Princes' lodgings), tore down the hangings, and actually stole the bed on which the King was accustomed to lie.

James I resolved on the immediate erection of a new Banqueting House on the same site. The City offered to rebuild it, but the offer was graciously declined by the King. Inigo Jones was entrusted with the preparation of estimates for the erection of the new building, and in April, 1619, he furnished an estimate for the work amounting to 9,850*l.*

The elaborate design for a new palace at Whitehall, on which Inigo Jones displayed the genius of a master mind, has become historic. The beautiful proportions and grandeur of the undertaking are preserved in the plans still to be seen at the British Museum, Windsor Castle, and at Oxford. The initial step was to be the building of that portion of the stately pile known as the Banqueting House, and in the west view of the original plans of the new palace the part erected is easily distinguished. Unfortunately for the architectural beauty of London, this great design was never carried out. The money to complete the work was not available. The times were full of intestine strife, and the reigning monarch was too often at war with his own Parliament to be able to raise the money necessary for such an undertaking.

The first stone of the new Banqueting House was laid June 1, 1619, and on March 31, 1622, the building was completed, at a cost of

14,940*l.* 4*s.* 1*d.* The stone used was quarried on the Isle of Portland, county Dorset.

The Exchequer was frequently exhausted, and it was not uncommon to replenish the State coffers by means of forced exactions and outrageous fines imposed on officials and others, under the pretence of offences committed against the Crown. When the Banqueting House was begun there was little ready money on hand. The Exchequer was empty, and if it had not been for a melancholy scandal at Court it is questionable if the money requisite for carrying on the work would have been forthcoming, and whether the building would have been erected. There had been a bitter quarrel between Frances, second wife of Thomas, Earl of Exeter—a lady of great virtue—and Lady Lake, wife of Sir Thomas Lake, and her eldest daughter, wife of Lord Roos. The cause of the quarrel does not satisfactorily appear, but Lady Lake and Lady Roos did not hesitate to accuse the Countess of the most disgraceful crimes. These accusations threw the Court into a perfect uproar of excitement, in consequence of which His Majesty sent for the Countess. In the most pitiable manner she protested her innocence before the King. To offset this denial, Lady Lake and her daughter deliberately forged what purported to be a written confession of guilt on the part of the Countess of Exeter, and, gradually becoming more deeply involved in the plot, they perpetrated one forgery after another, until the King became suspicious and personally investigated the charges. These he soon found to be nothing but fabrication. He valued Sir Thomas Lake as an old friend and trusted servant, so he besought him not to embark in the quarrel, which in no way reflected on him, but to leave his wife and daughter to the law. Sir Thomas, however, always a man of high character and honour, excused himself from following His Majesty's advice, and, declaring that "he could not refuse to be a husband and a father," put his name with theirs to a cross bill in the Star Chamber. The King presided in person during the five days occupied in the trial. Lady Roos in the midst of the trial made a complete confession of the entire plot, which resulted in her getting off free; but Lake and his wife were sentenced to pay a fine of 10,000*l.* to the King, and 5,000*l.* damages to the Countess of Exeter, and to be imprisoned during His Majesty's pleasure. It was the payment of half of this fine that replenished the empty Exchequer and enabled the officials to appropriate 1,000*l.* towards the building of the Banqueting House. Thomas Locke, writing to Sir Dudley Carlton, June 9, 1619, says: "There is no money in the Treasury. Sir Thomas Lake hath paid 5,000*l.* of his fine, whereof 1,000*l.* is assigned towards the building of the Banqueting House. This is the chiefest stocke they have in the Exchequer, as the Exchequer men say."

Inigo Jones built the Banqueting House under his appointment as surveyor of the King's works. He was assisted by Nicholes Stone as master mason, whom, a few years later, Charles I appointed master mason of Windsor Castle. Stone not only proved himself to be in fact a master mason, but he excelled also as a statuary. There are several of his monuments in Westminster and St. Paul's. The fine

sculptured memorial of Sir Francis Vere at Westminster Abbey is attributed to him, and is a further proof of his genius. So highly is it esteemed as a work of art that a *fac-simile* of it confronts the visitor as he enters Kensington Museum.

The first occasion on which the Banqueting House was used was before its completion. In April, 1621, King James I kept St. George's Feast in the grand room, which, in a letter from John Chamberlain to Sir Dudley Carlton, is described as being too fine, and not suitable to the rest of the house.

Peter Paul Rubens came to England in the spring of 1629, as Ambassador from Flanders, sent by the Infanta Isabella. Rubens possessed, to a marked degree, the virtue of being faithful to whatever he undertook to do. During his various embassies he devoted his entire attention to the duties of his mission, laying aside, for the time, the profession he loved so well. The special business with which Rubens was entrusted to England was no easy task to accomplish, and his reception by the English Court was viewed with some apprehension. Through the diplomacy of Carlisle, Cathington, and Carlton, he was, however, received, feasted, and entertained, with many demonstrations of regard. The King's passionate love for the fine arts is well known. He had excellent taste, possessed keen and accurate judgment, and was a thorough critic. For several years he had admired the marvellous genius of Rubens, and at the time Rubens came to England many of his paintings had preceded him here. It is not generally known that as early as 1621 Rubens had been selected to paint the pictures for the ceiling of the Banqueting House. Undoubtedly this was largely due to the influence of the Duke of Buckingham, who had formed the personal acquaintance of Rubens while at Paris. What the great painter himself says about this work and his own qualification to execute it, possesses unusual interest. "As to His Majesty and the Prince of Wales," wrote Rubens to W. Trumbull, in September, 1621, "I shall always be very pleased to receive the honour of their commands, and, with respect to the hall in the new palace, I confess myself to be, by a natural instinct, better fitted to execute works of the largest size rather than little curiosities. Every one according to his gifts. My endowments are of such a nature that I have never wanted courage to undertake any design, however vast in size or diversified in subject." But, while he was thus early selected for the work, it is not probable that he was commissioned to execute it until his first and only visit to England, in 1629—some eight years later—when he made the sketches for the pictures. Owing to his diplomatic engagements and other work, Rubens did not finish the painting until the summer of 1634. When completed, the canvas remained in Antwerp rolled up and cracking, because no one saw to its removal. Charles I's agent at the Hague, B. Gerbier, was chagrined to hear the gossip that idle tongues spread abroad regarding the King's neglect to pay and send for the painting. He did his best to urge immediate action in this respect. In August, 1634, he wrote to the King himself, entreating him to send for the painting. "May I then relate," he says, "what malicious tongues

and ignorant spirits utter, seeing the great work of Sir Paul Rubens hath made for your Majesty's Banqueting House lie here as if for want of money. Spaniards, French, and other nations talk of it." The same day he uses less reserve in a letter addressed to Sir Toby Matthew, exclaiming: "For God's name must he (Rubens) be expedited, that ye world may have noe subject to talke." Through his exertions the duties were removed, and the canvas was permitted to pass free. Rubens found the pictures somewhat injured from having been long rolled up, and as he was suffering from a severe attack of gout, and feared it would be impossible for him to go to England and see the painting placed in the Banqueting House, he set to work and retouched and finished it. The painting was finally encased and shipped to England in October, 1635. Still Rubens remained unpaid. He gave a power of attorney to Lionel Wake, Jun., to receive payment, which was made in different amounts and at different times, stretching over a period of several years, until June 4, 1638, when the last of the 3,000*l.* was paid. The King caused a medal and a rich gold chain to be presented to Rubens as a special mark of his appreciation of his work.

This painting, which forms the ceiling of the Banqueting House, is executed in the rich and brilliant style which distinguishes Rubens' best pictures. It is considered to be one of his greatest productions. Competent judges esteem it to be one of the finest ceilings in the world. "I cannot leave this place," says Ralph, "without taking some notice of the admirable ceiling performed by Rubens, which is, beyond controversy, one of the finest things of the kind in Europe. 'Tis, indeed, not so generally known as one could wish, but it needs only to be known to be esteemed according to its merit."

The work was executed at Antwerp, and in it Rubens was assisted by his pupil, Jordeans. The ceiling is divided into nine compartments. The oval contains the apotheosis of King James I. This represents the King on his earthly throne, turning with honour from Mars and other of the discordant deities, and giving himself up to Commerce and the Fine Arts. On the two long sides are large friezes with genii, 9 ft. in length, who are loading with fruit and sheaves of corn chariots drawn by lions, bears, and rams. The other two pictures in the centre range represent King James as Protector of Peace, enthroned, and appointing King Charles I his successor. Four pictures at the sides contain allegorical representations of Royal Power and Virtue. The original sketch for the middle compartment was preserved at Houghton. It belonged to Sir Godfrey Kneller, who is said to have often studied it, as is evident from Sir Godfrey's original sketch at Houghton, for the great equestrian picture of King William at Hampton Court.

Rubens' pupil, Anthony van Dyck, who had visited England in 1621, returned in 1629, when his wcrk grew rapidly in public favour. The decoration of the ceiling of the Banqueting House made it all the more necessary to embellish the walls of this magnificent chamber appropriately, and to Van Dyck is due the credit for having designed what, had it ever been completed, would have been one of his largest and finest productions. He confided to Sir Kenelm Digby his idea of

painting the history of the Order of the Garter on the walls of the Banqueting House, and, through the latter's kindly offices, the proposal was made to Charles I and received with every demonstration of approval. The subjects chosen were the institution of the Order by Edward III, the procession of the Knights in their habits, the ceremony of the installation, and St. George's Feast. It is stated that the King intended to have them worked in tapestry. There is no question but that Van Dyck made a sketch of his design. It was in the Royal collection at the time of its dispersion. In the inventory of Royal effects we find among other articles "at the armory at St. James: No. 2. A sketch on two boards of the Processione of ye Knights of the Garter, by Vandike, 005.0.0. Sold to Mr. Wagstaffe, ye 16 July, 1650, for £5." This sketch subsequently came into the possession of Sir Peter Lely, as appears from a printed catalogue of his pictures, where it is stated to have been in King Charles' possession. It was owned by the Earl of Northington in 1782, and engraved by Robert Cooper, etched, and afterwards aquatinted, and printed in brown in imitation of the original sketch. When, at Lord Northington's death, his pictures were sold, Sir Joshua Reynolds purchased the sketch for 64*l.* It is now in the Duke of Rutland's collection at Belvoir Castle. The order for the work, however, was never given. Whether the price demanded by Van Dyck or the troubles of the King was the cause of its being abandoned does not appear. The estimated cost—something like 80,000*l.*—would, in itself, be quite enough to prevent the execution of the design, a sum quite beyond the then possible resources of the Exchequer. Well might we exclaim with Vertue: "Inigo Jones, Rubens, and Van Dyck! Europe could not have shown a nobler chamber!" Van Dyck was knighted by the King, and his early death would have prevented the completion of this work had it been begun. He died at Blackfryers, December 9, 1641, and was buried in St. Paul's, near the tomb of John of Gaunt.

Ben Jonson and Inigo Jones were the joint authors of several of the elaborate masques performed by Royalty in the Banqueting House. The last masque in which they appeared as joint authors was "Chlorida," and it was the placing by Ben Jonson of his name before that of Inigo Jones which gave the latter serious offence, and caused a bitter and lasting quarrel between these former staunch friends. This masque was intended to personify the rites of Chloris and her nymphs, and was presented by Her Majesty and her ladies at Shrovetide, 1630. The masque was in celebration of some rites done to the Goddess Chloria, who, in a general council of the gods, is proclaimed Goddess of Flowers. In the masque Zephyrus holds a dialogue with Spring, in which the former sings:—

Come forth, come forth, the gentle spring,
And carry the glad news I bring
To earth, our common mother:
It is decreed by all the gods
The heav'n, the earth, shall have no odds,
But one shall love another.

Their glories they shall mutual make,
Earth look on heaven for heaven's sake ;
Their honours shall be even :
All emulation cease and jars,
Love will have earth to have her stars
And lights, no less than heaven.

Inigo Jones's power at Court enabled him to deprive Jonson of the Court patronage, and resulted in the City of London temporarily withdrawing an annual payment of 100 nobles, which had been paid him as the City's Chronologer since his appointment to that office in September, 1628. They gave, as a reason for its withdrawal that Jonson "had not presented any fruit of his labour"; but in September, 1634, through the strenuous exertions of his friends, the City ordered his yearly pension to be continued and the arrears paid. Ben Jonson was always an improvident manager, and when he had money in his pocket he spent it with thoughtless prodigality. The loss of the Court patronage so crippled him financially that he was finally reduced to penury and want. His quarrel with Inigo Jones was the downfall of Ben Jonson's social and political ascendancy at Court. Thenceforth he was without the influence of Royal favour, was shunned by the Court, and abandoned by his aristocratic associates. He was left alone to work his revenge in withering satire upon his former faithless friends. The Banqueting House, therefore, can be said to have been indirectly associated with the misfortunes and ruin of Ben Jonson. His declining years were clouded with disappointment. On the marble tablet to Jonson in Westminster Abbey there is a carved masque—a touching reminder of the dramatic art, in which his wonderful genius displayed itself in those masques, many of which were so brilliantly rendered in the Banqueting House.

In 1632 William Prynne published his "*Histriomastix*," aimed generally at all dramatic performances, and as the Queen was then particularly prominent in the parts she assumed in the brilliant masques rendered at the Banqueting House, the book was at once said by her friends to be an infamous libel against Her Majesty. As is well known, Prynne was tried in the Star Chamber, and with all the infernal wickedness too often brought into use in that ill-famed apartment. The denunciatory sentence pronounced by the different members of the Court has rarely been exceeded in malignity and extreme enmity, culminating in the Earl of Dorset's decree that the prisoner pay a fine of 10,000*l.*, be perpetually imprisoned, branded in the forehead, slit in the nose, and have his ears cropped. Prynne actually suffered the infliction of this sentence. It is true that his book was characterized by gross and defamatory aspersions against those indulging in harmless amusements; but it may be questioned whether the book itself was solely responsible for the rigorous proceedings brought against its author. It is possible that Charles I had had for some time past his eye upon Prynne, whose ready pen had been actively employed in scathing terms against one of the King's foibles. His Majesty wore his hair in long, flowing locks, especially

one or more locks on the left side much longer than the rest. This is readily seen on his seals and in nearly all of his pictures. William Prynne had a great dislike for these long locks of the King's, and for this reason, it is said, he wrote and published, in 1628, a tract entitled "The Unloveliness of Love Locks," a work aimed indirectly at His Majesty. Naturally the King must have smarted under its bitter invective, but he was unable to take any notice of it, for to do so would have been confession that the shaft had not only been aimed at him but had struck home. The affront thus given, however, was not overlooked, and later the King had ample retaliation in Prynne's condemnation in the Star Chamber. He was imprisoned several years in the Fleet, the Tower of London, Carnarvon Castle, in North Wales, and on the Isle of Jersey, until he was discharged in November, 1640. After his liberation he returned to London, where he was received with great popular demonstration of rejoicing, and was almost immediately chosen to Parliament. But his sufferings appear to have ripened and mellowed his judgment, and his views became broader and nobler. He soon saw through the plot to dethrone the King, and from the first he became one of His Majesty's most staunch and devoted adherents. He seems to have completely thrown aside all remembrance of whatever cruelty had been inflicted upon him, and, with a magnanimity almost unequalled, to have defended the King from pure conviction of justice and right. On December 4, 1648, he delivered a memorable remonstrance to Parliament in opposition to their proceedings against the King. "I do here solemnly protest," he said, "against the proceedings as altogether null, void, unparliamentary, illegal, unchristian, if not perfidious and treasonable." Noble words, fearlessly spoken, and at a time when to have uttered them might have cost him his head. At the Restoration, Charles II was not insensible to Prynne's heroic efforts in behalf of his father, and, besides making him the recipient of many Royal favours, he gave him the custody of the Records in the Tower of London, and continued him in that office until the day of his death.

When Prynne was so cruelly punished public feeling ranged itself into two great factions, one censuring Prynne and his book and applauding his punishment, the other encouraging his independence and condemning his persecutors. Among the former were the four Inns of Court, which took sides against their professional brother, and to manifest their opinion of Prynne's new learning and serve to confute his "*Histriomastix*" against interludes, they provided their Majesties with a magnificent masque on Candlemas Day, 1634.

It was called "The Triumph of Peace," and was written by James Shirley, while the music was composed by the celebrated William Lawes and Simon Ives, and the scenery was designed by Inigo Jones. The theatre for this grand display was the Banqueting House, a stage being erected at the lower end opposite the state. The gallery behind the state at the upper end of the Banqueting House was reserved for the gentlemen of the Inns of Court. The grand masquers were four gentlemen of each Inn of Court, selected on account of their personal appearance, dancing, and dress; and it was ordered that

they should be drawn in four chariots, four masquers in each chariot, by six horses to a chariot. It appears, however, that a difference arose about the order of their going, which of the Inns of Court should have the first chariot, and so on; and also how the several grand masquers should sit in the several chariots, who in the first or most prominent place, and who in the second, third, and last place. To satisfy this rivalry, it was proposed and assented to by the committee that the cars should be made after the fashion of the Roman triumphant chariots, which, being oval in form, would avoid any choice in the different seats. In selecting the colours and in determining the precedence of the chariots, it was agreed that one representative from each of the Inns of Court should throw dice, each society to be bound thereby. On the evening of the masque, the masquers and their company proceeded in gorgeous procession from Ely House, in Holborn, to the Banqueting House. The spectators thronged the streets in thousands, and the Banqueting House was so crowded with fine ladies, glittering with their rich clothes and fairer jewels, and with lords and gentlemen of great quality, that there was scarce room for the King and Queen to enter. Their Majesties stood at a window to see the masque come by, and they were so delighted with the splendour and magnificence of the show that they sent to the marshal and requested that the procession might again pass before them. "The masque," says Whitelocke, "was incomparably performed in the dancing, speeches, music, and scenes; none failed in their parts, and the scenes were most curious and costly." The Queen joined in the dance with some of the masquers, and the great ladies of the Court were very free and civil in dancing with every one. The masque continued until it was nearly morning. The cost of this spectacle is said to have amounted to 21,000*l.*

There is no incident in English history more fascinating in its dramatic surroundings than the closing scene of the life of Charles I. The precise spot from which he passed upon the scaffold has been the subject of long and frequent discussion, and yet one would infer that the circumstances surrounding an event so public would have been easily determined. These circumstances, however, have always excited the greatest public interest, as well as stimulated the historical and antiquarian student to the most thorough research.

While thousands of spectators beheld the execution of the King, the exact point out of which he passed from the Banqueting House to the scaffold has been so variously stated as to lead to doubt and confusion. Few questions have excited more controversy, and few have remained subject to greater dispute. There is not any statement or theory of this most public occurrence which is not controverted by evidence of high respectability, so that, whatever opinion you may have adopted as the true one, you are liable to have your views questioned. One fact, however, has remained beyond dispute, and that is that Charles I passed through the Banqueting House to the scaffold on which he was beheaded. He left this building to meet his martyrdom. Whether from this spacious Banqueting House he passed to the north, to the south, to the east, or to the west upon the scaffold

makes comparatively little difference to the majority of people. The important and historical fact remains that here in this identical building he passed, unflinchingly, to his death. If, however, we analyze the different accounts of the execution we shall find that all of them, with one exception, can be reconciled. The single exception alluded to is the assertion by Pennant, that the King passed out of a small building then attached to the north end of the Banqueting House. But Pennant's statement is so overwhelmingly contradicted that it cannot be relied on. It is beyond dispute that the scaffold was erected adjoining the Banqueting House. It was not adjoining the building to the north of the Banqueting House. Why, then, should those who arranged the details of the execution have resorted to a passage made through an adjoining building instead of gaining access to the scaffold through the building adjoining to which the scaffold was erected? Not only this, but there is the testimony of Sir Philip Warwick, who was assured by a friend of his who had so placed himself in Wallingford House that he could easily see all that was done upon the scaffold, that he saw the King come out of the Banqueting House on to the scaffold. Wallingford House stood on the site of the present Admiralty. But should this statement of Sir Philip Warwick be said to be mere hearsay—the reflection of something said—there is still another bit of evidence on the point which appears to have been overlooked. The "Moderate Intelligencer" for the week beginning January 25, 1648-49, and ending February 1, 1648-49—covering the day of execution—not only states that the scaffold was erected against the Banqueting House, but that it was made from a window thereof. If the King came out of the Banqueting House he certainly did not come out of a building to the north of the Banqueting House. The positive, affirmative assertion of this fact by an eye-witness, transmitted through so reliable an authority, should be accepted in preference to negative statements by persons who were not present.

But, besides this direct evidence, there is such an improbability in Pennant's statement, when considered in the light of the circumstances immediately connected with the King's death, as to impair its credit and reliability. If we consider the motives which actuated the leaders in the tragedy we perceive that, prior to the convening of the High Court of Justice, his enemies sought every means to humiliate and debase the King. When brought a prisoner to Windsor, the House ordered those about him to refrain from bending the knee; the members of the High Court of Justice remained covered in his presence; soldiers were permitted, unrebuked, to spit in his face and smoke in his chamber; they would not give him a cushion to sit upon; they scoffed at him most vilely; he was beheaded with the common malefactor's axe and by the common executioner; the place selected for his execution was in front of the Banqueting House, the scene of so many of his festivities and of meetings between the King and his Parliaments; and finally the George which he gave to Bishop Juxon on the scaffold, and which was intended for his son, the Prince, was ordered by Parliament not to be delivered to him. It was quite a harmless thing to have requested, and the officious prohibition

against this remembrance of a dying father to his son illustrates the venomous hatred which rankled in the breasts of the King's persecutors. Nothing that might degrade and humiliate his kingly pride was omitted. The committee appointed by the High Court of Justice to select a place for the King's execution evidently had this purpose in view in selecting the Banqueting House, "so from thence," as Perrin chief wrote, "where he used to sit on his throne and shew the splendour of majesty, he might pass to his grave, there parting with the ensigns of Royalty, and laying them down as spoils where he had before used them as the ornaments of Empire. Thus did they endeavour to make their malice ingenious and provide triumphs for their revenge." Bearing in mind the motive by which the committee were actuated, for them to select a building other than the Banqueting House would seem most improbable. To do so would be to destroy the very object they had in view, which was to debase the King as much as possible by executing him as a common felon amid the scenes and surrounded by the associations of his former power and magnificence. We must, therefore, lay aside the narrative of Pennant and his friends and turn to one more probable from the evidence we have at hand.

The remaining accounts on this question can be briefly summarized as follows:—Herbert says there was a passage broken through the wall by which the King passed on to the scaffold. Jesse and Walcott both say immediately in the centre of the building, between the upper and lower windows, a passage had been broken in the wall through which the unfortunate King passed. Eachard, Kennet, Heath, and an early account printed in 1684—the Journal of the High Court of Justice, attested by Phelps, the Clerk—state that he was conducted to the scaffold by a passage made through a window. Ludlow asserts that the King was conducted out of a window. William Sanderson (1658), William Winstanley (1659), W.H.B., printed by Henry Bell (1660), and Sir S. Baker (1660) say he went out of the great window, which was enlarged; while the three Scotch Commissioners sent to England by the Kirk of Scotland, consisting of the Earl Lothian, Sir John Cheisly, and Robert Blair, on the very day of the execution, wrote to the Commissioners of the Kirk at Edinburgh as follows:—

Covent Garden, 30 January, 1648-49.

Right Revd. and Honble.,

This day about two of the clock in the afternoon His Majesty was brought out by the window of the balcony of the Banqueting House of Whitehall, near which a stage was set up, and his head struck off with an axe, wherewith we hold it our duty to inform you; and so, being in haste, we shall say no more at this time, but that we remain

Your most aff. friends to serve you,

LOTHIAN.
JO. CHAISELIE.
RO. BLAIR.

*For the Rt. Revd. the Comrs.
of the Kirk of Scotland, met at Edinburgh.*

At first these different statements appear to be impossible of reconciliation. With the single exception of Pennant, however, they are all capable of intelligent explanation.

An examination of old prints and engravings shows that, at various periods during the last century, the Banqueting House was represented as having one or more blank windows. It is not probable that the artists who drew these pictures, which bear evidence of great detail and accuracy, would have inserted blank windows unless they existed. They would not misrepresent such an important feature of the building. Therefore, we can safely assume that at those different periods (as well as at the present time) there were blank windows in the Banqueting House. For instance, there is an engraving of the Banqueting House by Samuel Wale, published in 1761, which shows the windows on each side of the centre window as blanks; a picture of the Banqueting House by B. Green in "Noorthonck's History of London," published in 1773, and a print in the British Museum, dated 1794, show the same thing; an engraving by T. Malton in 1781, as also a plan of the first floor of the Banqueting House, made in 1796 by J. T. Groves, Architect and Clerk of the Works at Whitehall, represents the 2nd, 3rd, 5th, and 6th windows as blanks.

The statements of Jesse and Walcott that "immediately in the centre of the building, between the upper and lower windows, a passage had been broken in the wall through which the unfortunate King passed" are most improbable. An examination of the interior of the building is all that is necessary to demonstrate the impossibility of adhering to a literal interpretation of this statement. Taken literally, the passage referred to must have been made between the windows facing the main floor and those above, on a line with the gallery or with the windows of the basement below. To do this you would have to destroy the gallery or the floor of the hall, and permanently damage the structure of the building itself. But the reference by Jesse and Walcott to the upper and lower windows was not a reference to altitude, but to position. What they referred to were the windows at the upper and lower end of the room. In an account of the coronation ceremonies of Charles II in the Banqueting House we find reference made to the upper and lower end of the building; in describing the reception of the Spanish Ambassador in January, 1629, Lord Dorchester said that the ladies "stood from ye state to ye lower ende of ye Banqueting House"; Whitelocke, who was personally instrumental in getting up the masque by the four Inns of Court in 1633, says that the gallery behind the state was reserved for the exclusive use of the gentlemen of the Inns of Court, and that the scenes were prepared at the lower end of the Banqueting House; while in the account of the masque published at the time by Shirley, its author, we are told that at the lower end of the room opposite the state a stage was erected.

It is evident, therefore, that the ends of the Banqueting House were commonly distinguished as the upper and lower end, and that the end where the state or throne was placed was known as the upper

end. This is the south end of the building, directly underneath the large high window; for, in describing the saving of the Banqueting House from destruction during the fire of January 5, 1698, Sir Christopher Wren says he placed a bricklayer "in a very dangerous post in the high window over the throne."

We may assume, therefore, that the allusion by Jesse and Walcott to the upper and lower windows was used in the same way that the expression was used in the instances referred to. Their description of a point immediately in the centre of the building between the upper and lower windows, in view of the contemporaneous writings quoted, undoubtedly had reference to a point midway between a window at the upper end and a window at the lower end of the Banqueting House. This would be what is now the centre window. This window was probably a blank window at the time, and the removal of the obstruction might well be spoken of as breaking a passage through the wall. Considered in this light we have the exact position before us—a blank window; this blank window in the centre of the building; windows at the upper and lower ends of the building; and the removal, partial removal, or enlargement of the obstruction with which the central or middle window was closed.

Turning to Herbert's account, we are told there was a passage broken through the wall. This statement cannot be taken literally, any more than that of Jesse and Walcott. The wall of the Banqueting House is composed of solid masonry, and is several feet in thickness. Its massive stonework and columns preclude the probability of such an unnecessary and destructive act. It would have been a senseless waste of time and money, and a shameless destruction of property, to break a hole through the wall of the building, and there was no necessity for such an act with the windows facing the street. The wall spoken of by Herbert must have been the obstruction which blocked up the centre window, the removal of which might very easily have been taken for the breaking of the wall itself.

An examination of the narratives of Eachard, Kennet, Heath, and the Journal of the High Court of Justice already mentioned shows that the King was conducted to the scaffold by a passage made through a window. In considering these statements we must not lose sight of the fact that it is alleged that the King did not pass through a window as one would ordinarily do if there was nothing peculiar about it, but that it was by a passage *made* through a window. Mark the word *made*. It represents action, force expended, something done. Ordinarily there is nothing necessary to be done to a window in order to obtain ingress and egress. If the window is of glass you can open the frames or smash the panes; if of wood you can open the blinds or break them. You make nothing doing so. The window is there already, and the passage also. But where the window is a blank, and presents a solid face of bricks and mortar, then, in order to pass through it, a passage has to be made, and it was such a passage undoubtedly to which these and all other chroniclers refer. Ludlow asserts that the King was conducted out of a window,

and in the absence of any other reference we can safely fix on that window as being at the point given by Jesse and Walcott, to wit, "immediately in the centre of the building"—a point identical with the window of the balcony mentioned by the Scotch Commissioners. We may therefore take for granted that at the time of the execution of the King there were blank windows in the Banqueting House, as we know there were at a later period—perfectly-constructed windows, but filled up with masonry or obstructed in some way so as to practically form a wall. Any other theory renders the accounts worthless and, in fact, absurd from their mere impossibility, while the assumption of the fact of the removal of the material with which the centre window must have been filled makes them harmonize and agree.

In the other accounts to which we have referred, it will be noticed that special mention is made of "the great window" and "the window of the balcony." A glance at the Banqueting House will show that the balcony is before the three centre windows. Yet the question remains to be determined what particular one of the three windows was *the great window* and *the window of the balcony*. All the windows are alike in height and breadth. Therefore the word "great" was not applied to the size or proportion of the window. The word "great" was more likely used as designating its position, prominence, and use. The balcony windows are central and conspicuous, and if the centre window was opened it might naturally be called the great window and necessarily the window of the balcony. If the centre window was not the window referred to by Sanderson, Winstanley, W. H. B., Baker, and others, as the great window, and by the Scotch Commissioners as the window of the balcony, to what window did they refer? Where else in the Banqueting House is a window to be found which comes anywhere near answering the designation? There was no reason why the Scotch Commissioners, all men of high reputation and integrity, and friendly to the King, should state anything but the truth. Their letter was written on the very day of the execution and while all the horrible details were present before them. In point of time it is contemporaneous with the event. Then, again, it is not the expression of a single individual, but the deliberate and united report of three men of recognised position and influence. Their business in London was connected directly with the King and with an effort to spare his life if possible from the resentment of his enemies. Therefore, of all people in the world they would be the most likely to know all the circumstances relating to the King's execution, and their report is a conclusive affirmation of the theory which we have adopted in explanation of the less definite statements of the writers whom we have quoted.

To sum up the evidence, we finally arrive at the conclusion that, on the one side there is Pennant, with a statement intrinsically improbable, single-handed, and alone, while arrayed against him there are a score and more of authorities whose accounts are all capable of reconciliation, and, when reconciled, lead to but one intelligent conclusion, to wit, that Charles I passed from the Banqueting House upon the

scaffold out of the centre window, an obstruction to which had been removed for that purpose.

Even the present generation retain the respect of their ancestors for the sanctity of this spot. It has always been a place towards which the adherents of the dynasty of the Stuarts have turned as a pilgrim does to the sacred city of his faith; and generation after generation have been accustomed to venerate the place where Charles I died as the spot where the blood of a martyr was shed. To this day you can see the exemplification of this feeling of love in the silent homage paid by many of those who pass beneath the Banqueting House touching or lifting their hats. It is an affecting sight to behold this inborn fealty for the dead King finding its outward expression amidst the noise and rumbling traffic of the great city.

On December 16, 1653, the Articles of Government were signed and Oliver Cromwell was proclaimed Lord Protector. He drove from Whitehall Palace to Westminster Hall between two lines of soldiers, attended by the Lords Commissioners of the Great Seal, the Barons of the Exchequer and Judges in their robes, the Council of the Commonwealth, the Lord Mayor, Aldermen, and Recorder of London in their scarlet gowns, and many of the distinguished officers of the army. At the conclusion of the ceremony at Westminster, the Protector returned in state to the Banqueting House, the Lord Mayor, bare-headed, carrying before him the Sword of State, the soldiers shouting, and the cannons firing. At the Banqueting House, Nicholas Lockier, one of Cromwell's chaplains, made an address, after which the Lord Mayor, Aldermen, and Judges departed. Cromwell was dressed in a suit and cloak of black velvet, with long boots and a broad gold band around his hat.

A few years later the country beheld the spectacle of its Parliament obsequiously tendering the title of King to the Lord Protector, while he, craving the gift, dallied with the offer, as a child might with forbidden fruit, restrained as he was from pushing his ambition too far by the dread of his own army. The scene of these conferences between Parliament and the Lord Protector was the Banqueting House. Parliament appointed a Committee of its distinguished members to wait upon Cromwell at the Banqueting House and tender him the title of King. There were many meetings held between the Committee and the Lord Protector in this building. On April 11, 1657, the Committee again repaired to the Banqueting House, when the Lord Chief Justice addressing Cromwell said, "The name of King is a name known by the law, and the Parliament doth desire that your Highness would assume that title." The Lord Protector, however, was still uncertain in his own mind regarding public feeling and did not dare to proceed to such an extreme measure hastily. Therefore he procrastinated and put the Committee off. But before long he became convinced that the nation would not support his adoption of the title of King. He found the majority of the army, on whom he mainly depended, strongly opposed to his assumption of regal honours, and finally his heart failed him in carrying out this skilfully conceived scheme. Having requested the Committee to once

more meet him at the Banqueting House on May 8, 1657, he addressed the Speaker, Sir Thomas Widdrington, and declined the offer, using, in the course of his speech, the memorable words, "I cannot undertake this Government with the title of King."

Cromwell and his family were not accustomed to the manners and surroundings of the aristocracy. Their sudden transportation into the palatial precincts of Whitehall found them but indifferent hosts and quite incompetent to perform the ordinary functions of Court duties. But Cromwell endeavoured to follow in the footsteps of his Royal predecessors. He received Ambassadors, interviewed his Parliament, and entertained at banquets his Officers of State and others within the stately Banqueting House. Some strange tales have come down to us regarding the manners of his Court and the domestic economy exercised in the management of his household affairs. One of these refers to a banquet given to the Members of Parliament in the Banqueting House in 1659. A woman who happened to be near Cromwell's table when the sweetmeats were served desired a few candied apricots. Colonel Pride, who was sitting at the table, instantly, with both hands, threw some wet conserve into her apron and stained it all over. As if that had been the signal for the beginning of the hilarity, Cromwell caught up his napkin and threw it at Colonel Pride, who returned it with the same vigour, while every one at the table became engaged in the scuffle. The noise and tumult made the guests rise from the tables before the sweetmeats were placed upon them, believing, as they did, that the banquet was over, whereupon they entered into frolic with the Lord Protector. Whether Cromwell desired to imitate the customs of the Anglo-Saxons or not does not appear; but this feast reminds us forcibly of one of them. Each man when he sat at table did not take his seat according to his own fancy, but according to his age, rank, and position. At the Court of King Cnut, the nobility and officers of the household were commanded to their places according to rank, and those of the same rank according to their seniority in office; and if any one took a higher place than belonged to him, he was degraded to the lowest and all the company were permitted to throw bones at him without being guilty of rudeness or liable to challenge.

At the Restoration, Charles II made his stately entry through the City of London to Whitehall Palace. In the evening, both Houses of Parliament waited upon the King in the Banqueting House and tendered him an address of congratulation. In answer, the King desired to be excused from making a long reply owing to extreme weariness, but he told them they should not be more ready to propose anything to him for the good of his people in laws, liberties, and religion than he would be to grant them. The Speaker and all the Members then kissed His Majesty's hands. The King was dressed in a plain stuff suit with a plume of red feathers, the Duke of York with a white one, and the Duke of Gloucester, green.

The extent to which the Banqueting House figured in connection with the coronation of Charles II forms another interesting link in the chain of associations with this historic building. The ceremonies

were of a splendour and magnificence rarely witnessed. Sixty-eight Knights of the Bath, six Earls, and six Barons were created in this building. Attired in suits of white satin, with surcoats and mantles of crimson taffeta lined with white, white gloves, white boots, and white hats with white feathers, the candidates presented a brilliant array as they entered the Banqueting House, and were duly invested with the dignity of knighthood by His Majesty, who sat under the Cloth of Estate. Among those invested with the kirtle and hood were—Edward, Lord Hyde, Lord Chancellor of England, who was created Earl of Clarendon; Arthur, Lord Capell, created Earl of Essex; Thomas, Lord Brudenell, created Earl of Cardigan; Arthur, Viscount Valentia, Earl of Anglesey; Sir John Greeneville, Earl of Bath; and Colonel Charles Howard, Earl of Carlisle.

Immediately after Charles II returned to England he proceeded to re-establish the ancient Royal customs, and in the summer of 1660 he began to touch for the King's evil in the Banqueting House. The surgeons caused the sick to be brought up to the throne, where they knelt before His Majesty. The King stroked their faces with both hands at the same time, while the chaplain, attired in his vestments, said: "He put His hands upon them, and He healed them." This was repeated to each suppliant. After they had all been touched in this way they came up again in like order, when another chaplain, kneeling and having angel gold (pieces of money so called from having the figure of an angel on them) strung on white ribbon on his arm, handed them one by one to His Majesty, who put them about the necks of those who had previously been touched as they passed, the chaplain at the same time repeating, "That is ye true light who came into the world." The religious part of the ceremony consisted of the reading of the gospel, an epistle, the liturgy, prayers for the sick, and the blessing.

St. George's Day was often celebrated in the Banqueting House by the Companions of the Order of the Garter. That held in 1667 was the occasion of a great feast. The King sat alone at a table placed at the upper end of the hall, while the Knights had a table at one side reaching the entire length of the room. Opposite to them was an elaborate sideboard containing gilded plate. At the lower end musicians were placed, as well as trumpets and kettledrums in the gallery. The King was waited on by the Lords and Pensioners, who brought up the dishes. At the middle of the dinner the Knights drank the King's health. Then the King drank theirs, whereupon the trumpets sounded and the music played. The Queen entered the apartment and stood on the left of His Majesty. Each Knight had 40 dishes to himself, so that they were piled five and six high. The room was beautifully decorated, and was hung with the richest tapestry.

A somewhat surprising use to which the Banqueting House was put was that of a lottery under the personal patronage of the King. Charles II permitted one of his favourites, Sir Arthur Slingsby, to have his lottery in the building. Among those present were the King, the Queen-mother, the Queen-consort, the Duchess of York,

and, of course, His Majesty's favourite beauty, Lady Castlemaine. Those who should have known said some pretty hard things regarding this lottery. Pepys found it good sport seeing how many who paid their 10*l.* went away with only two globes, although it was said there was only one blank. The King and Queen fared no better than the others present. There was one wise man present, however, a Mr. Cholmley, who did a good stroke of business by going among the vast concourse of distinguished people present and insuring them against drawing the blank number for the sum of 12 pence a head. As it happened a gentlewoman, whom he chanced not to insure, drew the blank. Evelyn attended the lottery, but was disgusted. He did not hesitate to denounce its author as a shark.

For nearly a century foreign Ambassadors were received in the Banqueting House. It was the grand audience chamber where all the ceremonies of state were held with much splendour. The throne, with its rich cloth of state, was placed at the upper or south end of the room. Here the Ambassadors from the different countries of the world presented their credentials to the King. They did not come quietly and without ostentation. On the contrary, the different representatives vied with each other in the splendour of their pageants and the number and costumes of their retinue. The Muscovite Ambassadors brought presents of furs of the black fox, sable, and ermine, cloth of gold, hawks, and Persian horses; while those from the Barbary States came with horses and lions as Royal gifts. The details of these audiences would in themselves fill a volume. It was at the Royal banquet given in the Banqueting House to the French Ambassador, Count Colbert, that Evelyn first saw pineapples served. This then rare fruit was cut up by Charles II, and passed to those near him as a mark of special favour.

At the close of the 17th century there were two serious conflagrations at Whitehall, one on April 1, 1691, and one on January 5, 1698. The first broke out at night in the upper part of the Duchess of Portsmouth's lodgings, and before it could be extinguished all the buildings fronting the privy stairs were burnt. The greatest apprehension was felt for the safety of the palace and the Banqueting House. The second fire was that which doomed the palace of Whitehall, and of all that stately and historic collection the only building that escaped the ravages of the flames was the Banqueting House. The King was so concerned about the Banqueting House that he sent messenger after messenger from Kensington urging every means for its preservation. Sir Christopher Wren claimed the credit of saving the building. When the fire got into the building adjoining on the south he saw that the danger would be in its breaking through the large high window at the upper end of the Banqueting House, and that if he could have the window bricked up it might stop the fire. Therefore he ordered a labourer to procure any bricklayer he might find, who happened to be one John Evans, and he, with the assistance of labourers then at hand, stopped up the window according to Wren's directions, and the building was saved.

The destruction of Whitehall, including the Chapel Royal, induced

the King to set aside the Banqueting House for the purposes of a chapel. This must have been done at once, for in June, 1698, Sir Christopher Wren had been some time at work in fitting up the Banqueting House for that purpose. In 1724 George I directed that the duty of preaching in this chapel should be performed by 24 priests, one-half of whom were to be Fellows of the University of Oxford and the other half from Cambridge; two of them to be recommended monthly by the Dean of the King's Chapel, with salaries of 30*l.* per annum; certainly not a very Royal allowance. The first sermon under this regulation was preached on Easter Sunday in April, 1724.

The Banqueting House, thenceforth known as the Chapel Royal, Whitehall, year after year, was the scene of the distribution of the Royal Bounty on Maundy Thursday. The ceremonies associated with this ancient custom have, therefore, a peculiar interest when considered in connection with this building. Maundy Thursday, as many know, is the Thursday before Good Friday. The greatest diversity of opinion has existed as to the derivation of the name and the origin of the custom. One theory is that the word is derived from the Saxon word *mound*, which later became *maund*, a name for a basket. Thus Shakspeare says: "A thousand favours from her maund she drew." Hall, in his satires, speaks of "a maund charged with household merchandize." Drayton tells of "a little maund being made of osiers small;" while Herrick says:

Behold for us a naked graces stay
With maunds of roses for to strew the way.

He also speaks of maundie as alms:

All's gone, and death hath taken
Away from us
Our maundie; thus
The widows stand forsaken.

The more generally accepted theory, however, is that maundy is derived from *mandatum*, from the mandate of Christ to His disciples to break bread in remembrance of him, or from his mandate after he had washed their feet: "A new commandment I give unto you, that ye love one another."

Whatever its origin may have been, the custom is among the most ancient of those ecclesiastical observances connected with the English Church. In the Royal use of the maund in England the number of doles (or its equivalent) was, and still is, according to the age of the reigning monarch. James II was the last King who performed the ceremony of washing the feet of the poor. Since then this ancient rite has been deputized, and the Lord High Almoner has officiated as the King's representative. The distribution of doles was retained until 1738, since which time the maundy men and women have received money instead of the dole.

Not the least of the incidents in the history of the Chapel Royal has been its participation in the glory associated with the victory of

English arms over her enemies. In May, 1811, amidst the acclamation of thousands of spectators and the sound of martial music, a company of grenadiers, supported by a brilliant escort of military and headed by the Dukes of York and Cambridge, bore the eagles and colours captured in the late war to the Chapel Royal. Among the eagles was one taken at Barrosa by the 87th. There was not any colour remaining on the standard—that had been shot away—but it was unlike the other eagles in having a wreath around its neck. Among the colours was the so-called Invincible Standard taken in Egypt. It was so tattered that the mottoes were not legible, a bugle in the centre being the only figure discernible. The ceremony in the Chapel was most impressive. As the words of the Te Deum, “We praise thee, O Lord,” were sung, twelve grenadiers silently entered the right and left doors bearing the trophies, and accompanied by an escort with fixed bayonets, they proceeded to the front of the altar, where they halted. The choir again took up the Te Deum and sang it through, after which the six eagles were elevated against the two semi-circular divisions of the altar piece, three on each side, the butts about 6 ft. from the floor and the upper parts held by double gilt chains. The six French colours were arranged horizontally over the gallery. There is an interesting legend connected with the eagle taken at Barrosa. The French eagles, as a rule, were attached to the staves on which they were borne by a screw, so that in case of extreme danger they might be taken off and saved from falling into the hands of the enemy. Napoleon, however, when he presented this particular eagle to the 8th, observed that it was impossible this standard should ever be taken by any foe from so fine a body of men who had on so many occasions exhibited proofs of the most determined valour; for which reason he desired the eagle might be riveted to the staff. His wish was complied with, and, but for that order, this trophy would probably not have fallen into the hands of their opponents on the heights of Barrosa—the gallant 87th.

A year later the eagles and colours taken from the French in Spain were deposited in the Chapel Royal with much ceremony. The Royal Family were present. Two of the eagles were captured at Salamanca. These were very much mutilated. Two taken at Madrid were in a state of better preservation, while the fifth was found in the channel of a stream near Ciudad Rodrigo, into which it had been thrown by Massena's army when pressed by the British cavalry on the retreat from Portugal. Among the standards was the garrison flag of Badajoz, which was like a sieve and stained with human blood.

January 18, 1816, was appointed a Day of General Thanksgiving to Divine Providence on the re-establishment of peace in Europe, and it was selected as the occasion for placing the eagles captured at the Battle of Waterloo amidst the other trophies of war. Among those present in the Chapel Royal were their Royal Highnesses the Dukes of York and Gloucester, the Earl of Liverpool, and there was a brilliant and distinguished assembly. As soon as the first lesson had been read by Archdeacon Owen, the Chaplain-General, two squads of sergeants

bearing the eagles entered by the two doors, and marching up to the communion table to the strains of martial music, fixed upon it their consecrated banners.

One more circumstance remains to be mentioned. It is perhaps the most pathetic of all. History has not only recorded the staunch stubbornness of Napoleon on the field of Waterloo, but its pages have left a touching memento of the faithful "Marengo," who, with distended nostrils and fiery eye, bore his rider safely and with undaunted courage amidst the perils and carnage of that awful struggle. Death at last silenced both horse and rider. The character and life of Charles I always possessed a particular fascination for Napoleon. He admired his culture and love for the fine arts; he delighted to read of his reign, to peruse the course of his melancholy wanderings when driven practically a refugee from the capital, and to dwell upon the black record of his condemnation and death. But how wonderful, how startling is the irony of fate! Here, within the Banqueting House, the scene of the glory and death of Charles I—the hero of Napoleon's admiration—will stand all that remains of the faithful "Marengo." It is remarkable that, of all places in the world, his bones should find sanctuary within the very building where the King whom his master loved so well went to his death. Tried friend and companion of better days, ever faithful and loyal! You had your master's love, while we our admiration give and homage pay to the brave and illustrious "Marengo."

This ancient building—the last remaining link that connects us with the Whitehall of the past—has come into your hands as the worthy custodians of its keeping. Your Institution is representative of the valour, strength, and integrity of the nation. To you, who through years of steadfast duty to your country have braved perils on land and sea, Her Majesty the Queen has entrusted this historic edifice—a fitting repository for the precious mementoes and reliques you possess. Guard it, treasure it, and preserve it; and may you unite in pledging yourselves to never let it be said that the Banqueting House was, but is no more!

The CHAIRMAN (General Erskine): Ladies and gentlemen, I feel quite sure that you will all agree with me in thinking that we have listened to a very interesting and most instructive lecture. Accordingly, we should give our best thanks to Mr. Bartlett for having produced it and taken the trouble to come here to read it to us. In this theatre it is usual for the Chairman to reserve any remarks which he may have to make until the end of the proceedings, but to-day I must ask you to allow me to deviate from that practice, inasmuch as I have been summoned to the Commander-in-Chief's office. Before I go I wish to say a few words, not in the shape of criticism, but rather as a supplement to what has fallen from Mr. Bartlett. You are aware, or most of you must be aware, that we are about to leave these dingy premises, and I think we are all very glad to go. You have heard a great deal lately about evicted tenants and tenants living under the apprehension of eviction, and a good deal of sympathy has been shown to these people. But I think the rule is that wherever a tenant pays his rent he is pretty safe to remain where he is. Unfortunately, with regard to the United Service Institution the case has been different. Ever since our formation, about 60 years ago, we have been the tenants of these premises, and, although we have paid our rent most punctually whenever it became due, yet we have been living for the last 20 years

under the apprehension of being turned out. Of course that is a very disagreeable position for anybody to be in, but those who know how to wait generally get what they want. In our case, our deliverer came in the person of Her Gracious Majesty. You have been told by the author of the paper that for about 200 years the Banqueting House has been used as a place of worship, as one of the Chapels Royal of the kingdom, but between two and three years ago that arrangement was brought to a close, and, when that happened, Her Majesty, in consideration of her great regard for the two services of the army and navy, offered us the use of the building. Of course her offer was very gratefully accepted, although at the time it was made we saw very clearly that the Banqueting House in itself would not be sufficient for all our purposes, and therefore we were necessarily involved in making additions to the building. These building operations are now going on, and, of course, a great deal of money will be required for them, and I may say here, by way of parenthesis, that if you come across anybody who has got money that he does not know what to do with, by all means warn him not to put it into an Australian bank, but rather to send it to us, and we will take very good care of it. When this lecture was projected, it was suggested to us that it might take place in the Banqueting Hall itself, but unfortunately that could not be. Circumstances prevented us from doing it, and to-day it occurred to me that I might possibly invite the audience to go over to the Banqueting Hall to look at it, after hearing what Mr. Bartlett has told us, but I am sorry to say that that cannot be done, for the building is now full of workmen, and anybody that has had the misfortune to be engaged in building knows that the contractor's people must not be interfered with. But I hope that before long you will have an opportunity of seeing the Banqueting Hall in its new phase, and I think you will then consider that we have done our duty in transforming it into what it is. I will now ask my colleague, Admiral Boys, to take the chair for me.

Lieutenant-Colonel BAYLIS, Q.C.: I think we must all admit that this is a most opportune paper. It has given us information which will be useful to us at the laying of the memorial stone next month. The paper contains a lucid and interesting historic sketch of the Grand Hall. We are told that the masque which was performed before their Majesties in the Banqueting Hall, in 1634, cost 21,000*l.* We are going to expend about that sum in adapting the Banqueting Hall and in the additional buildings which, unlike the masque, will be a useful expenditure and a lasting benefit to the army and navy, and, I believe, to the public at large. The lecturer has also told us that the Hall was used for a lottery, which disgusted Pepys; and we are going to have a bazaar which we hope will greatly conduce to the financial prosperity of the Institution. May I be allowed to make two other observations? Whitehall was the name given to what was York Place before the fall of Cardinal Wolsey. In Shakespear's play of "Henry VIII," Act 4, Scene 1, three gentlemen are represented as standing in that very road which the Banqueting Hall now fronts. The third gentleman, who had returned from the coronation of Anne Boleyn in Westminster Abbey, says:

"So she parted,
And with the same full state paced back again
To York Place, where the feast is held."

First Gent. Sir,
You must no more call it York Place, that's past;
For, since the Cardinal fell, that title's lost:
'Tis now the King's, and call'd Whitehall."

The old foundations of York Place were exposed to view when the new foundations were being dug. It may be also interesting to know that the fine old organ, to which the lecturer has alluded, has been recently removed to the Tower of London Chapel. It was built for the Hall, and was the first organ built by Father Schmidt in England. He also built the beautiful organ now in the Temple Church.

Colonel ALT: I think there are few, if any, of us present who are able to criticise the lecture we have heard, for the simple reason that Mr. Bartlett has exhibited such industry and research in the compilation of it that he surpasses any of us in knowledge of the subject. I certainly agree with the last speaker, that the paper

appears at a very opportune time, when the Institution is going to be installed in the memorable building; and I think I am expressing the feeling of all present in hoping that it will increase the interest everybody must take in the future housing of the Institution. A remark was made that we are not going to imitate our ancient predecessors and hold lotteries in the building; but I may call attention to the fact that it is the intention to hold a bazaar there, and although that function will not be conducted with any of the discreditable incidents of the lottery held there so long ago, I hope it will take the form of a lottery in some respects, and that many people will come out leaving a great deal more money in the building than they anticipated doing when they went in, and that the result will largely benefit the funds of the Institution.

Captain O'CALLAGHAN: I should like to know whether the lecturer can add to the deep obligation under which he has placed us by his instructive lecture, by giving us information on one or two points on which he has not touched. I think he has cleared up almost absolutely the difficulty and the difference of opinion with regard to the place at which Charles I made his exit from this building; but he has not mentioned—and there appears to be some doubt on the point—how the King came into the building. Perhaps also the lecturer may give us some information as to the object of the two strange arches which were disclosed at the south end of the building when the Dover House stables were demolished. These arches are very curious, and I have not heard any even plausible theory as to the reason of their construction. Perhaps the lecturer may be able to give us some information on this subject.

Mr. C. A. HERESHOFF BARTLETT: With regard to the first enquiry as to the way the King entered the Banqueting House, I may state that the Banqueting House was the northern part of what was an accumulation of structures constituting the Palace of Whitehall, and that ingress and egress to the Banqueting House was had through the galleries of the Palace. On the morning of the execution the King was escorted through St. James's Park to Whitehall, and passed through the gallery into his cabinet chamber, where he had to remain several hours. When summoned to the scaffold by Colonel Harker, he passed from his bed chamber along the galleries and into the Banqueting House. The question about the arches is one that I cannot answer. Probably they have something to do with the original plans of the new Palace contemplated by Inigo Jones, and an examination of the maps and plans now at Oxford, and in the British Museum, and at Windsor Castle, might throw light upon them. The only thing I recognise is the large window which must have been filled up by Christopher Wren at the time of the Fire.

Captain O'CALLAGHAN: The peculiarity about the two arches which attracted my attention is that they appear to have been built at the same time; because they had each of them a stone at each end which is common to both. It is extraordinary they should have built a semicircular stone arch with a low pitched brick arch immediately under it. The architect has had a beautiful photograph taken of the end of the building by the Stereoscopic Company.

Mr. C. A. H. BARTLETT: It is nothing more than proper I should state that the remarks made with reference to the building are very much condensed. There are many questions connected with this most interesting building which the limited time and space have prevented my going into, but I have not neglected them, and this Institution will have the benefit of whatever information I have gathered.

The CHAIRMAN (Admiral Boys): I am sure I shall be authorized by every one here to give our very best thanks to the lecturer to-day for bringing forward this subject, and also for explaining the history of the new buildings which we are so soon to inhabit.

Wednesday, May 17, 1893.

GENERAL SIR MARTIN DILLON, K.C.B., C.S.I., in the Chair.

THE PHONOGRAPH AND ITS APPLICATION TO MILITARY PURPOSES.

By Lieutenant-Colonel G. V. FOSBERY, V.C.

HAD I announced the title of this paper in our theatre but a very few years ago, beyond the idea conveyed by the etymology of the word, who would have had any clear notions of what a phonograph was, and who would have admitted that an instrument bearing such a title could by any possibility find a naval or military application?

Now-a-days we all know what a phonograph is, though perhaps all are not equally familiar with its latest developments, or the many uses for which it is designed, or to which it may be with advantage adapted.

I am about to bring some of these to your notice, to explain briefly, and I hope clearly, the construction and operation of the machine, and to prove, if possible, that for certain military purposes it possesses many advantages which are not shared by any other contrivance with which we are acquainted; and I do not expect at this date to be met with the smile which would, I feel sure, have appeared on many faces at such an announcement as this, had it been made at the period to which I have above alluded.

For, consider for a moment the number of appliances, creations of the civil engineer, the mechanic, the chemist, and the electrician, which have within but a very few years made good their right to be included in that vast assemblage of objects now known as matériel of war.

Who, in those early days, would have dreamed of transporting our heavy artillery by steam machinery, of applying the telescope to the sighting of the field gun, or electricity to that of the quick firer?

Could we have guessed that search lights would render attack as dangerous by night as by day, or that machine guns, worked and directed by a handful of men, would rival in their effects the fire of entire battalions? When the telephone first astonished the world by repeating speech at incredible distances, who foresaw that the soldier would bury it in the ground in advance of his outposts to give notice of the approach of an enemy, or the sailor sink it miles out at sea to signal the beat of a hostile propeller?

Who thought that we should substitute the photographic plate for the military sketch, or learn from it the behaviour of bullets travelling at over 2,000 ft. a second?

No sage predicted that we should so quickly exchange our gunpowder for some chemical compound, build guns of 100 tons, or fire 600 shots a minute from the barrel of a machine gun. He did not tell us of ships to run 27 knots, air tubes hurling hundredweights of dynamite; the Whitehead, the Brennan, or the Sims-Edison torpedo; and I am very certain, if he had, we should none of us have believed him.

And yet we have done or accepted all of these things, and I very much question whether any one present here believes that we have in any single branch of the art of war attained to that degree of perfection which would mean an approach to finality.

We have long taken it as a matter of course that the electric wire should connect our divisions with each other, and all with the headquarters of the army. That ground mines should threaten our men from under foot and the navigable balloon spy our movements overhead and enable an enemy to foil our combinations.

And now that a German tailor proposes to revolutionize war by bringing the bomb-proof man once more into the field, we do not treat the idea as being either absurd or impossible, but only wonder, should it really turn out to be true, what we shall do with him when we have got him. For it is evident that if troops can be rendered proof against the rifle, the bayonet, lance, sword, and pistol, some new means of disposing of them must be discovered forthwith, and some new battle of guns *versus* armour be put in hand.

In this temper I think we now-a-days approach almost any proposal for which definite advantages are claimed without that exclusive conservatism which has rendered military and naval progress slower than would otherwise have been the case. We take broader views for ourselves and do not run the old risks of confounding the new or surprising with the useless or impracticable.

Having thus far prefaced in defence of my choice of subject, I will now turn to the instruments before us, and give a short description of their principles and construction, and the means whereby the effects I shall have to exhibit presently are so simply yet perfectly produced.

We all, I dare say, clearly understand that, as distinguished from the telephone, neither magnetism nor electricity has any necessary connection with the phonograph; it is a question here of pure mechanics. The batteries you see are used in connection with a little motor which supplies the power for driving the machine, just as we might use clockwork, steam, or water power for the same purpose.

Any source of motion, the speed of which can be nicely regulated, answers the same purpose, and as this can be done, perhaps more conveniently in the case of electricity than in any other way, we make use of it accordingly. Electricity obtained from batteries has of course its inconveniences, and under many circumstances other powers can and will be made use of, and, as I have said before, the phonograph in its action is wholly independent of it.

The phonograph is a mechanical contrivance for recording sound, coupled with the means for producing identical sounds from the record aforesaid, at any place, after any subsequent interval of time, the means by which this is done being extremely straightforward and simple.

Apart from the framework, supports, and motive power, the whole record is produced by three principal parts; chief of these is the diaphragm, after all a very old device for the reception and transmission of sound vibrations, now so familiar to us from its use in the telephone for this purpose.

But many of us will, I dare say, remember how the old non-commissioned officer, as related in Baron Marbot's memoirs, when in doubt as to whether their small party was pursued by the Austrians, placed a drum on the ground and, listening at the drum-head, at once detected the march of their troops, though then at a very considerable distance.

The same device has been used from time immemorial for detecting the driving of a gallery by an enemy's miners. And in the latter case the dancing of a pea on the drum-head makes their motions visible as well as audible. In these primitive telephones the earth took the place of the wire and the drumhead of the diaphragm, in our more perfect instruments, and thus, *mutatis mutandis*, the plan has remained good down to the present day.

In the phonograph we next have a tool or point, fixed in a frame, which will permit of vertical, but not of lateral, movement, and so connected with the diaphragm as to move with it.

Thirdly, comes a cylinder, capable of being indented or inscribed by this point. This was formerly made of wax, but is now formed of some soapy composition, the exact nature of which is not generally known. In this combination, the diaphragm is set in vibration by sound, and the point, following its motions, cuts into the cylinder (which is made to revolve beneath it) a groove or channel corresponding in depth to the amplitude of those vibrations, and longitudinally to their number, with the greatest exactness.

Sounds thus placed on record are reproduced by three similar parts working in an inverse order. Thus the cylinder is caused to revolve beneath a point which rests in the groove, forming the record, of which it follows all the details, whether of depression or elevation, and whether few or numerous.

As this point is connected with the diaphragm, as before, it will evidently compel the latter to make vibrations exactly corresponding in every respect to those which it went through when making the record, and, as a necessary consequence, emit sounds identical with those which then set it in motion.

As a matter of course, the recording point, which is really a cutting tool, is not used for repeating lest it should wear or destroy the record. But we now substitute for it a round-pointed instrument, capable of following the inscription in its minutest detail.

How exceedingly small some of these are, may be judged from the fact that even the largest are barely visible to the naked eye. The

cylinder which you see here carries 200 lines of writing to the inch, and as, moreover, less than one-half the width of the line is occupied by the record itself, the latter is only the 1/400th of an inch in height, while even smaller sizes than this have been successfully used.

For such record making as this, and for deciphering such minute inscriptions, special tools are of course necessary. The best steel wears out quickly under the work, and these instruments are therefore now made either of ruby or sapphire, so constructed (small as they are) as to be able to be turned into three different positions, and become again available when one edge has become worn or blunted by use.

The diaphragm, after trial of many substances and various dimensions, is now made of fine glass, about 6/1000ths of an inch in thickness, and 1 $\frac{3}{4}$ of an inch in diameter, and to this the recording and repeating points in their appropriate mountings are attached by shellac varnish.

With these dimensions we can readily understand that no motion of the point can be detected by the eye, even when recording or repeating the loudest sounds, and when, therefore, the diaphragm is in the most violent state of vibration of which it is capable.

Such then are the operative parts of the phonograph, which we will now consider in their proper places on the machine, together with the means used for bringing them into play, and the adjustments necessary to ensure their proper performance.

The complete instrument, as we see it here, consists of a bed-plate of cast iron, carrying in suitable bearings a long screw of 200 threads to the inch, of which one end is connected to the motor, of whatever nature, and the other carries a mandril, on which is fixed the cylinder.

When the machine is set going, the screw, and with it the cylinder, revolve in their places, but have no other motion whatever.

Above them is a frame, which is supported at the back by a tube sliding on a bar, and which runs the whole length of the machine; and in front by a rail, on which its lower edge is made to rest.

This frame carries the diaphragm with its recording and repeating points, and is free to carry these points from one end to the other of the cylinder.

Attached to it, at the end of a bar, is a portion of a nut corresponding to the threads of the main screw, and which can be connected or disconnected from it by lowering or raising the front edge of the sliding frame to or from the rail which supports it.

When this is disconnected, the frame is wholly independent of the motive power, and may be slid into any position relative to the cylinder, by hand.

When, however, connected, its motions depend entirely on the screw. If then it be lowered, the point brought in contact with the cylinder, and the machine set going, the point will evidently cut in it a spiral groove from one end to the other, having as many threads to the inch as has the main screw, which sets it in motion.

Now, unless the diaphragm be in vibration, this screw thread will be perfectly smooth, regular, and of uniform depth, just like any other screw thread cut by similar means. For after all, up to this point, the phonograph is a small screw-cutting lathe pure and simple. In the present case we have, when the operation is completed, a groove on the cylinder, some 350 ft. in length, and capable of containing about 2,500 words, or over four pages of our Journal; and all this matter may, of course, be put on the cylinder simply by reading it into the mouth of the tube connected with the upper surface of the diaphragm.

For, now the diaphragm is set in vibration, the groove is no longer smooth and regular, but contains thousands of minute ridges and hollows of greater or less depth and frequency, capable of repeating by the process before described every syllable it has heard, each with its proper emphasis and intonation. And this it can be made to do for hundreds of times in succession, without injury or deterioration.

Lest the cylinder should have become scratched or indented by any means before receiving the record, a little sapphire knife is provided, which precedes the recording point, and takes off a light cut from the surface, which it leaves beautifully smooth and polished for the reception of the inscription.

This knife will also turn off a record for which we have no further use, and prepare the cylinder for a new one. Thus we may turn down a cylinder and put on it fresh correspondence, at least one hundred times; in fact, it may be used over and over again, until too thin to be of any further service.

So far the formation of the record itself. When it is finished, as we see, the cylinder can be at once detached from the machine, and we are now in possession of speech, song, or instrumental music in a tangible form crystallized for our use, and of which we may avail ourselves as we please.

We can hear them deciphered here and at once by the same instrument, we may store them for future use, or we may send them by post to India, America, or the ends of the earth, there to be read out by a duplicate of the machine which produced them. Thus, without the intervention of any connection between the two instruments, as in the case of the telephone or telegraph, the sounds heard in this room to-day may be reproduced at any interval of time or space in all their freshness by purely mechanical means.

To do this, all that is required is to place the cylinder on the mandril, run back the frame to the commencement of the record, bring the point into position, and start the motor, taking the simple precaution of setting the speed to the same as that used when the record was made, and which ought to be found indicated by a note attached to the cylinder itself. We must also assure ourselves that the repeating point occupies the exact position held by the records when the writing was produced. This is easily done by means of this small micrometer screw, a very trifling alteration making, as you will hear, a wonderful difference in the distinctness of the repetition: when we remember that the width of the writing is only the 1/400th

of an inch, and that therefore a movement of one 1/800th would take the point half off the record, it will be seen at once how necessary the power of making these minute adjustments becomes.

Again, as regards speed. In the case of musical sounds it is absolutely necessary that the speed of the recording and repeating machines should be exactly the same, if the music is to be repeated as it was delivered, for as each note is caused by a definite number of vibrations per second (no more and no less), should we alter the speed of the machine, and pass a greater or less number of indentations under the point, thereby causing a different number of vibrations in the diaphragm in the same time, it is evident the value of the note would be changed; and, as a matter of fact, if we double the speed of the machine, we raise the music one octave, or lower it an octave by halving it.

For speech, where it is only necessary to get at the intentions of the speaker, attention to speed is less necessary, but if you desire to recognise the voice of your correspondent it is well it should be strictly attended to, unless, indeed, you do not mind hearing a fine manly voice turned to an absurd squeak, or a lady speaking in the tones of a bass singer.

In order to ensure accurate correspondence in speed, the phonograph is provided with a very sensitive governor, which can be set to regulate it within 1 per cent. of any number of revolutions per minute from 60, which is about the best for speech, to 160, which would be used for taking down a cornet solo.

One more detail will now complete our survey of the machine. In the earlier instruments, when it was necessary for any reason to raise the point from the record, by hand, it required much nicety to be able to replace it exactly where it stood before, and much time was occasionally lost in the attempt to do so. Now these small levers at the side of the instrument do what is required without conveying the slightest motion endwise to the point, and lower it into the exact spot from which it was raised. Thus we can stop the reading at any point, and recommence, sure that we shall go on from exactly where we left off, and for copying or type-writing from the phonograph this is a great convenience.

We thus have a machine differing in almost every respect, beyond first principles, from the early models of five or six years ago, one in which every necessary point has been carefully thought out, and every source of error as far as possible corrected.

There still remains one fault, which, however, I must say rather spoils the pleasure that could be taken in it simultaneously by all the members of an audience such as the present, than impairs its general usefulness. It has unfortunately hitherto been found impossible to discover any substance from which to make the tube or trumpet used for intensifying the sounds of the diaphragm, and making them audible throughout a large room like this, which will not give them a certain metallic harshness, and in some way distort them.

Mr. Edison says the two best tubes he has had were made the one of gold, the other of battered tin.

The latter of these is the only one I shall be able to exhibit here to-day.

I am sorry that it is out of my power to provide in sufficient numbers the small rubber tubes through which the phonograph is in the habit of speaking in private; but I trust that after the conclusion of my paper all who care to do so will examine the instruments, and listen to what they can say in the smaller way, in which, at all events for the present, they will chiefly develop their value as labour-saving machines.

In the near future they are certain to effect a considerable revolution in the present methods of business and official correspondence, the labours of which they are so well able largely to curtail.

To-day the official or business man on arriving at his office will read and annotate his letters, send for his stenographer, dictate his replies, and by the evening have them written or type-written, copied, and ready for signature.

To-morrow he shall dictate his answers to the phonograph, and send off the cylinders themselves by post at once, or he may give them to his clerk, who will type-write them direct from the machine, saving the time and wages of the shorthand writer altogether, to say nothing of eliminating one fruitful source of error and delay.

I have lately seen a small instrument which takes two copies of anything spoken into it simultaneously, one for the correspondent, the other to be retained as an office copy for reference, and this would in many cases do away with the necessity of type-writing altogether. The only difficulty that I can see is the large space that would be occupied by the cylinders in proportion to the matter they contain. We remember, however, the earliest phonographs, in which the substance written on was a sheet of tinfoil, which could afterwards be laid out flat, and, if needs be, no doubt the same thing could be done again with some other substance and under better conditions.

One thing, at least, is very certain, that cases occur every day, whether in military, civil, or private correspondence, when the power of substituting a talk for a letter, and of conveying the actual words of the sender in his own voice to the recipient, secure from any possible indiscretion of a third person, must possess an inestimable advantage from a practical point of view. The sentimental side of the question we need not here allude to. The ease and rapidity with which this may be done by means of the phonograph must be evident to all. At first sight, for employment in the field, the necessity for carrying about a delicate and complicated machine, with its batteries or accumulators, would seem entirely to preclude its use in such situations. But as I explained before, the working parts on which its efficiency depends are extremely few and simple. Substitute for the electro-motor with its batteries, wires, and governor, some other power, and you at once get rid of the cumbrous and objectionable parts of the machine; and an extremely light, simple, and portable form of the instrument, which can be easily carried in its leather case by an orderly, and used anywhere, has already been made.

It consists merely of the main screw and sliding diaphragm frame with their simple adjustments, and is worked by turning a handle at one end, the speed being accurately regulated by means of a small ball governor, and it will make a record which can afterwards be read off on a similar instrument, or on one of the larger machines.

I have heard a record made by it during some field manœuvres, and while a heavy artillery fire was going on, in which, however, curiously enough, the reports of the guns entirely fail to be heard.

The fact of the matter is that the phonograph takes no notice of such sounds, and refuses to write them down.

The reasons for this are probably twofold. The first being the low tone of the sound, and therefore the fewness of the vibrations caused by it. The second that the concussion of the air reaching both sides of the diaphragm at once, the latter will be apt to remain nearly stationary, and whether for one or both of these reasons set down nothing recognisable.

This peculiarity has, of course, its value, for the sounds of the voice spoken into the instrument come out clear and sharp, and are in no way drowned by the noise going on around. Now that the spaces covered by troops in action have been so immensely increased, laterally from the necessity for open order in face of modern infantry fire, and in depth owing to the great range of the field gun, it becomes every day more and more difficult to communicate orders and instructions from point to point. Flag and heliograph do good and important service, but we all know the uncertainties which attend the use of the Morse alphabet in the coolest and best trained hands. We know, too, the delays of cryptography and the additional chances of error which it introduces when this is employed, and the dangers of our signals being read by the wrong people when it is not.

Now, apart from the absolute accuracy of a phonographic despatch, and (when the voice of the sender can be recognised) its evident authenticity, nothing is easier than to cryptograph the message without an instant's delay. For, as I have already shown, in order to read a phonographic message, the repeating machine must be an exact duplicate of that which made the record.

The threads of the one screw, more particularly, must exactly correspond in number to the threads of the other screw per inch of its length.

If we were to attempt to read a record of this machine, with its 200 threads to the inch, on a machine with a screw differing only by 5 per cent., that is, carrying either 190 or 210 threads in the same space, we should entirely fail to do so. If then we should furnish our military machines with two or three screws of different pitches, the number of the screw used for any message being scratched on the cylinder, we should at once get a cryptographic message undecipherable by any one not in possession of an equivalent screw. Like almost any other cipher it might be worked out by special and delicate machinery at a vast expense of time and labour, and probably not until all the advantage of learning its contents had long ceased to exist. Besides, nothing is easier than to destroy such a

despatch if in danger of capture, as the cylinder is crushed in the hand in a moment, and its power of speech gone for ever.

A written document may be intercepted, a telegraph or telephone wire tapped, flag or heliograph signals interpreted, but phonograph messages ciphered in some such way as I have here indicated could by no possibility become of immediate use to an enemy.

In many cases they might be made to replace sealed orders with advantage, or contain plans and instructions for officers at a distance, which for one reason or another it would be important should only be known to those directly concerned.

It is one thing to get a surreptitious look at a paper, and replace it in case of the danger of surprise. It is a totally different matter to get hold of a phonographic cylinder, fit it to the instrument, and sit down to learn its contents.

How often have the finest combinations in war or in politics been frustrated by the imprudence or treachery of a trusted subordinate who has contrived to get a sight of confidential despatches!

With the phonograph, it is only needful that the sender should assure himself of his absolute isolation when dictating his despatch; these little tubes will insure it against being overheard while being repeated to the receiver.

Nor do its uses end here; the phonograph is essentially a labour-saving machine; the power it gives, during a press of work, of quickly disposing of large masses of correspondence without the assistance of a clerical staff needs only to be named to be appreciated.

If we admit that, here in Europe, where such contrivances are well known, the phonograph may still have useful duties to perform for service purposes, for India and many other countries its security and convenience will be undeniable; apart from other uses, the evidence of an important witness may be sent up, so to speak, *vivid voce*, to headquarters, and throw valuable light on a difficult case, when to transport the man himself would involve endless expenses and delays.

Moreover, information or testimony delivered in some *patois* or dialect imperfectly understood on the spot can now be sent to a competent interpreter with the certainty of obtaining an accurate translation. How important this often is will be readily acknowledged by those who best know the country. I well recollect a case of the kind which many years ago came under my own observation. The evidence of a Santhal was being taken before a General Court Martial, very grave issues depending on the man's testimony. The interpreter to the Court failed to understand his dialect, and wholly misunderstood his meaning; while the poor Santhal, perplexed by the high-flown language addressed to him, became more and more confused and unintelligible. Thus the danger that the prisoner, in whose favour he had been called, would be condemned for want of the light, which he alone could throw on the case, increased at each moment. A young officer happened, however, to be attending the Court, who had lately been shooting among the Santhal Hills, and who had picked up a fair amount of the language. Seeing how the

case was going, he stood up and asked the President of the Court to permit him to explain the man's meaning. The President desired him to question the Santhal, and finding they entirely understood one another's speech, and that the witness was content it should be so, had him sworn in as interpreter to the Court, and the matter ended in the acquittal of the prisoner; but, had it not been for the accidental presence of the officer in question, the case would probably have ended very differently.

Now, under such circumstances as these, to take down *faute de mieux* the man's evidence on this little instrument, and post the cylinder to one of the civilians in his district for translation, adjourning the Court pending his reply, would cost but little, and save all risk of doing may be a terrible injustice.

While on the subject of languages, I may say in passing that, now that they are becoming more and more necessary parts of a soldier's education, there is confessedly no better way for acquiring a correct pronunciation than the repetition *vivâ voce* of passages read and reread aloud to the pupil, by a painstaking and competent instructor. This, however, even should we always be able to obtain a teacher whose accent is above reproach, is one of those tedious processes which can now be better performed by machinery than by any person whatever.

The phonograph will read aloud, and repeat as often as is necessary in season and out of season, the passages spoken into it by the most perfect masters of the language. These, duplicated and reduplicated, may be sent all over the country, and, the lessons they contain being mastered, can be changed and renewed as often as needs be.

For such a purpose as this, and for musical and other forms of education, the phonograph, it is evident, will have a great number of uses.

If, however, I have succeeded in showing that the services need not despair of profiting largely by an invention which evidently has so great a future for those in every walk of civil life, I think I may feel satisfied that the object of this paper has been in large measure fulfilled.

Lieutenant-Colonel FOSBERY: A short time ago you heard a little speech addressed to the machine by Mr. Johnson. Here is the same speech which has since been type-written. It shows the way in which correspondence may be conducted by means of the phonograph. You can speak your letter into the machine, it can then be type-written and despatched. I am going to put on the machine now a very curious record, as it is called. The notes which you are now going to hear were blown by the trumpeter who sounded the charge of the Light Brigade at Balacava, into a bugle which has been preserved since the Battle of Waterloo, where it was used for a like purpose.

Lieutenant-Colonel BUCHANAN-DUNLOP: May I ask the lecturer if it is necessary to have a separate cylinder for each message, however short a message?

Colonel FOSBERY: Yes; but you must recollect, as I explained before, that the cylinder is by no means destroyed from the fact of putting one message on it. You can turn it down at least one hundred times, and some of them more. You can put correspondence on them as often as you want.

Colonel BUCHANAN-DUNLOP: I was only thinking what a large number of

cylinders you would have in the office where there was a large correspondence, and especially if the letters were short.

Colonel FOSBERRY : That is the case, and therefore I think very possibly it may be necessary to resort to small cylinders, as they would not take up very much space. Or you can use tinfoil.

Colonel BUCHANAN-DUNLOP : The cylinders might be made shorter?

Colonel FOSBERRY : Yes.

Captain O'CALLAGHAN : There is one advantage which, I think, may be expected from the general use of the phonograph. It would have a decided tendency to make speeches more brief and lucid. There is many a man who does not hesitate to trespass for a long time upon a meeting who would not be so ready to do so if he knew that every syllable he said was being accurately recorded. I think, also, there are some places in which that deterrent effect would be very decided. I hardly like to mention an instance, but possibly it might have some effect in the House of Commons, and tend to make speeches more concise and lucid. I think they would rather hesitate to speak when they knew that not only was their speech being recorded, but could be produced against them at any time. I also think it would be a very powerful deterrent to people who are not very particular as to the truth of their statements, for I am sure there are many men who are ready to say, "I said nothing of the kind," who would not be so ready to say so if you said, "Mr. So-and-So, bring in the phonograph." That is one of the indirect advantages which possibly might accrue from a general use of the phonograph.

The CHAIRMAN : Ladies and gentlemen, I do not think there appears to be anyone else who wishes to ask questions on the subject of the lecture which we have heard. For myself I do not think that Colonel Fosberry has left anything unsaid. I fully agree with him as to the great future which the phonograph has for military purposes. Perhaps one of the most important points is the complete destruction of the cylinder which he showed us—there was no tale left. If people got possession of these cylinders they would be no use to them. The lecture has been of immense interest and value. I have never before had such an opportunity as now of knowing the advantages and the future which remains for the use of the phonograph. I am sure we all of us unite in thanking Colonel Fosberry for the advantages we have received from the interesting lecture he has given us.

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FOREIGN SECTION.

RECENT PROGRESS IN MARINE MACHINERY.
By NABOR SOLIANI.

(Translated from the "Rivista Marittima" for June, 1893, by
T. J. HADDY, R.N.)

(Continued from No. 184.)

The auxiliary steam pipes are manufactured from seamless drawn tubes, and with regard to their safety the observations already made in speaking of steam pipes in general will apply. The auxiliary steam stop valves on the boilers are usually self closing, and similar to the main stop valves; the auxiliary steam pipes generally supply all the secondary engines and apparatus, with the exception of the main feed pumps and the small starting engine, which take their steam directly from the main steam pipes only; a connection to the auxiliary steam pipes would be useless in these cases. If the air and circulating pumps are worked by independent engines, these also take their steam from the main steam pipes when under way, the connection to the auxiliary system being used when necessary. In ships fitted with two fan engines in each boiler room, it is desirable that one of them should take its steam from the main, and the other from the auxiliary steam pipes, so that any injury to either of the systems would not cause the failure of the whole of the fan engines and ventilating arrangements; the steering engine also has a connection to the main steam pipes, for use in case of accident to the auxiliary steam pipes. The auxiliary exhaust are led parallel with the auxiliary steam pipes; they collect the waste steam from the whole of the auxiliary engines, and conduct it either to the atmosphere or to the auxiliary condenser; it is a good plan to have both these ways open, as it is quite sufficient that the vacuum in the condenser should be very slight; just enough to cause the steam to take this route in preference to that leading to the atmosphere, so that if from any cause the action of the auxiliary condenser should cease and this slight depression be lost, the steam will find an easy exit to the atmosphere without in any way disturbing the action of the auxiliary engines from which it proceeds. The waste steam pipe to the atmosphere from the auxiliary exhaust should be separate from those leading from the safety valves, so that their action may not be interfered with. As in this way regularity in the working of the auxiliary machinery is assured, there is no necessity to use the main condenser for any of the auxiliary engines, and,

therefore, considering the quantity of fatty deposits which finds its way from these engines into the condenser, I am inclined to think that the whole of the exhaust from the auxiliary engines should be excluded from the main condenser, the auxiliary condenser being used instead. Many, however, are of the opinion that for the starting engines, circulating, and main feed engines, when these are situated in the engine room, the exhaust to the main condenser should be used when under way, and for this reason it is usual to fit both main and auxiliary exhaust pipes to these engines. By using the exhaust to the main condenser when under way for those pumps which must be always kept at work, there is the advantage of a slight economy of steam, which, however, could be equally well obtained by using the auxiliary exhaust and heating the feed water; but it must be acknowledged that this method is not always convenient or practicable, either from the great variation in the quantity of steam which is discharged into the auxiliary condenser, or from the fact that frequently this condenser is not very favourably situated with respect to the feed circuit. The auxiliary steam pipes must be provided with separators, drain cocks, and automatic drain tanks where necessary, for dealing with the water arising from condensation, and also with reducing valves on those branches leading to the engines which work at a lower pressure than the normal boiler pressure. These valves, however, are not always reliable in their action, and, in my opinion, it would be better to avoid them altogether by making all the auxiliary engines sufficiently strong to stand the full boiler pressure. All the auxiliary engines must be fitted both with "steam" and "exhaust steam" stop valves, so that it may be possible to disconnect them completely from both sets of pipes. In order to prevent, as far as possible, the water, which may be condensed in the steam pipes, from finding its way into the engines, the branch steam pipe leading to them should be fitted at the top of the main supply pipe, or as high as possible on its circumference.

Separators.—These receptacles are applied both to the main and auxiliary steam pipes, but more especially to the first, as the ordinary automatic drain tanks are usually sufficient for the auxiliary system. These fittings are simple and well known; they consist of a vessel which forms an enlargement of the pipe at the lower part of it, constituting a sort of well which collects the water passing through the pipe with the steam, and they are generally fitted with a diaphragm which arrests the current of the steam and assists in separating the water from it; this diaphragm, however, causes an appreciable loss of pressure in the steam, and many are of the opinion that it is, on the whole, superfluous.

Clothing for Steam Pipes.—As the temperature of the steam is much inferior to that at which felt, wood, and other non-conducting materials are ignited, there would not appear to be any practical objection to their use for this purpose; but experience has shown that after a time the action of heat tends to lower the temperature at which these substances are burnt, and for this reason it is, perhaps, a good practice, which is now in force in the Royal Navy in England,

to cover these pipes with a non-combustible material. In the English Navy, also, it is usual to employ for the purpose a material impervious to water, so as to diminish the condensation in those pipes in case they come into contact with water.

Drain Pipes.—These may be divided into three groups, viz., for the main engines, for the steam and exhaust pipes, and for the auxiliary engines. For draining the cylinders, steam jackets, and receivers of the main engines, these parts are fitted with separate valves or cocks for each service applied directly without intermediate pipes. The drain pipes of the low-pressure and intermediate-pressure cylinders and their receivers discharge into the main condenser and bilge, those of the high-pressure and their receivers into the auxiliary condenser and bilge; the drainage from these latter containing more fatty deposits than that from the others. The jacket drains are separated one from the other, and can be opened into the bilge, or by means of a small automatic drain tank (Fig. 29) into the auxiliary condenser or collecting tank. The use of the auxiliary condenser is often necessary in order to cool the water before collecting it in the tank. The ends of the drain pipes to the bilge must be sufficiently high so that they can be seen readily from the starting platform, and at the ends of the other branches non-return valves fitted to prevent the return of the drain water. Drain cocks or valves are fitted to the large separators on the main steam pipes with separate pipes, so that the water may be discharged either directly to the bilge, or, by means of an automatic drain tank, to the auxiliary condenser. Similarly the water passes from the automatic drain tanks of the auxiliary steam and exhaust pipes by means of non-return valves and conducting pipes to the main drain tank, especially when the system is furnished with a pump for discharging the water into the main feed tank or overboard, as may be desired. The auxiliary steam pipes are also fitted so that the water can be drained directly into the collecting tank, without passing it through the automatic drain boxes; the main drain tank must be fitted with a manhole door and a vapour pipe leading into the auxiliary exhaust. The drains from the auxiliary engines contain a large quantity of greasy deposit, and for this reason should not be used for boiler feed water, but collected in a special tank from which it can be pumped overboard. The drain system, besides a saving in the consumption of fresh water, has the advantage that it eliminates one of the causes of dirty bilges, and, therefore, greatly reduces the labour in cleaning them; many bilges which would otherwise be constantly wet and dirty can be maintained dry and clean, which is no small advantage to the service and to the health of those on board.

Auxiliary Condensers.—After what has been said, little remains to be added on this subject; the condensation of the steam being effected in the auxiliary condenser at nearly the atmospheric pressure, it is somewhat more efficient than if effected with a vacuum, in consequence of the greater density of the steam. As this condensed water contains a considerable quantity of greasy deposit, it should be

filtered, or, at least, cleaned by the surface blow-off of the greater part of the grease, before discharging it into the main feed tanks. These condensers are generally made of brass or delta metal: bronze is also used, but this metal is less suitable, because it is necessary to maintain uniformity in the composition of the metals used in the construction as far as possible, in order to reduce the risk of galvanic action between the tubes and the shell plates to a minimum. Brouze is naturally used for the auxiliary air and circulating pumps; the speed of these pumps should not exceed 200 revolutions when working at full power. The air pump, as has been said, discharges the water into the small cistern of the condenser itself, and a small pump connected to this cistern serves to pump the water it contains either into the main feed tanks or overboard. The suction pipe of this pump is fitted to the lowest part of the cistern, but it is well to filter the water it contains, either by sponges, coke, or other material, fitted either in the cistern itself or to the pipe leading from it to the main feed tanks. In ships which are copper sheathed it is desirable to fit zinc protecting plates in the water chambers of the main and auxiliary condensers, and to coat the entire surface of these chambers internally with red lead, in order to avoid or diminish galvanic action with the hull.

Cylinder Jackets.—Little by little the much-debated question of the utility of steam jackets for the cylinders of modern triple-expansion marine engines is being solved. The principal facts brought to light by the successive experiments which have been carried out are the following:—1st. The action of the walls of the cylinder in the phenomena of the initial condensation of the steam, and of its subsequent re-evaporation, is the more active, and relatively the more injurious, the smaller the diameter of the cylinder. 2nd. The initial condensations and successive re-evaporations, although rapid, require a certain time for their development, and, for this reason, the velocity of rotation of the motor has much influence on their manifestation, because on this depends the duration of the alternate and successive phases of the two phenomena. The slower the motion the more intense is the action of the walls, and *vice versa*; and, in proportion as the rapidity of the phases increases, will the variations in temperature decrease, and the less intense will be the successive condensations and evaporation caused by these variations. 3rd. From the facts stated in 1 and 2 it results that steam jackets, the object of which is to counteract the effect of the cylinder walls, are less useful in proportion as the cylinders are larger, and the velocity of rotation of the motor is higher. It is for this reason that the powerful quick-moving engines of torpedo-boats and torpedo-cruisers, in which the jackets are omitted from weight-saving considerations, give, nevertheless, very good results, as far as regards the efficiency of the steam in the cylinders. 4th. In compound engines, and still more in triple expansion, the steam which is condensed in the first and second cylinders during the period of expansion, and re-evaporated during the period of exhaust, becomes useful steam for the successive cylinder or cylinders, so that steam jackets are less required in these than in simple or single engines, and, for the same reason, in triple expansion engines the

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FIG. 31.

ELASTIC PACKING RINGS, "MUDD'S SYSTEM."

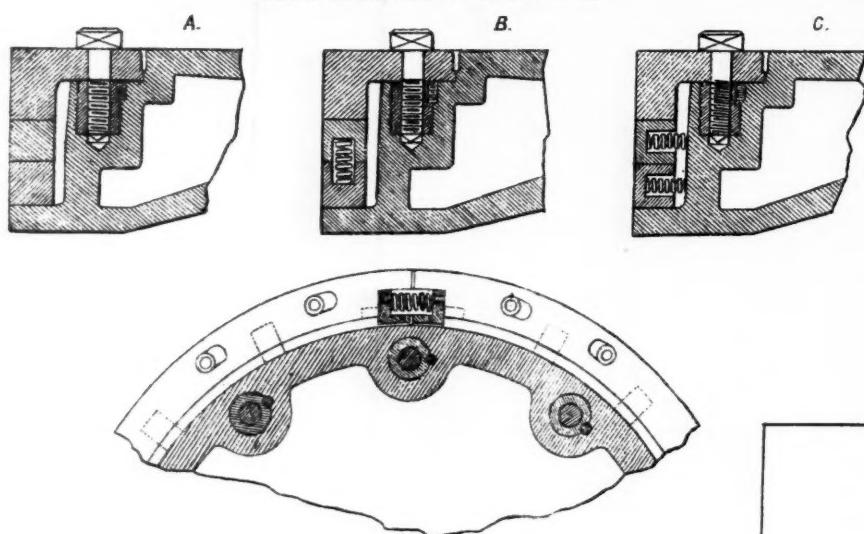


FIG. 34 — METALLIC PISTON ROD PACKING, "MARCOPOLI SYSTEM"

- A. A. Bronze collars.
B. B. White metal rings
in three segments.
C. C. Ambestos.

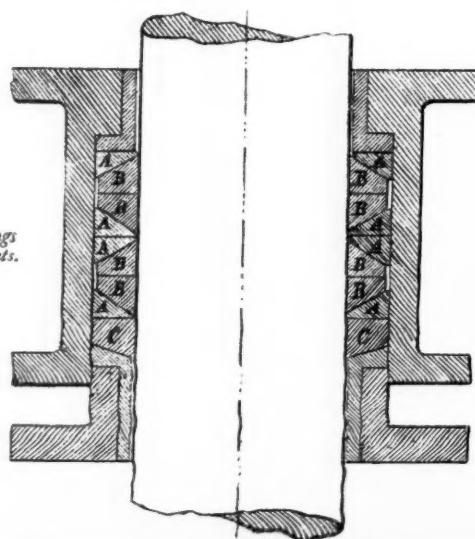


FIG. 32.

"RAMSBOTTOM" ELASTIC PACKING RING, WITH RING CARRIER.

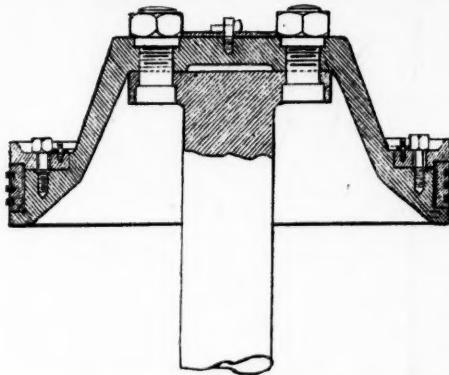


FIG. 35.

BALANCE CYLINDER FOR SLIDE VALVES, "JOY'S SYSTEM."

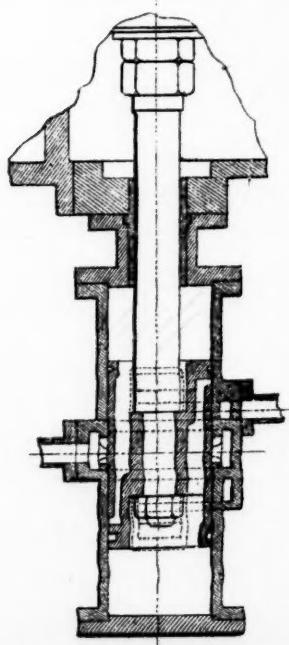
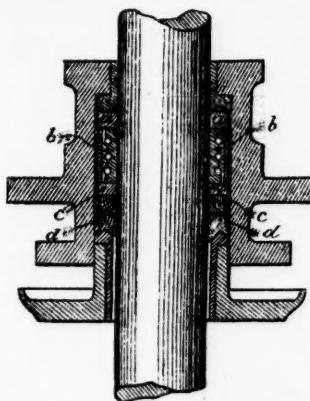


FIG. 33.

METALLIC PISTON ROD PACKING, "MARSHALL'S SYSTEM."



a. a. Ring box.

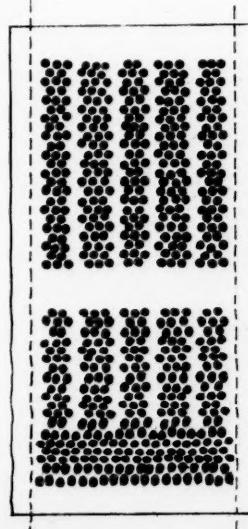
b. b. Marshall's ring.

c. c. Spring ligatures.

d. d. Asbestos.

FIG. 36.

ARRANGEMENT OF CONDENSER TUBES, "MUD SYSTEM."





steam jacket is most useful in the case of the low-pressure cylinder. 5th. For large marine engines, however, it is generally found advisable to fit steam jackets to all the cylinders, as it has the advantage that the inside liners in which the pistons work may be made of steel or special fine-grain cast iron. 6th. The jackets, to be efficient, must be kept well drained; this can naturally be better effected with vertical than with horizontal engines. 7th. The jacket drains are generally automatic in action, being fitted with the automatic drain tanks of which we have already treated. 8th. The action of the steam in the jackets is the more efficient the higher its temperature is with respect to the steam in the cylinder, and this is another reason why the jackets are especially useful for the low-pressure cylinders. It follows as a corollary that the steam in the jackets should be kept as high as possible consistent with safety. 9th. For economy of weight, and to render the design of the cylinder more simple, it is now a rare practice to extend the jackets to the cylinder ends and cylinder covers, but they are limited to the shells only, where they are the most useful, as these always present internally a clean metallic surface to the steam in the cylinder, resulting in a more active condensation and re-evaporation process. 10th. Lubricating substances, and also air mixed with the steam, lessen the action of the walls, but both these are to be avoided, as they are otherwise injurious.

Any who desire further particulars on this question should consult the excellent work of Mr. Charles Busley, "The Marine Steam Engine," where it is fully treated of. See also "Steam Engine Trials," by Mr. P. W. Willans; "Research Committee on Steam Engine Trials," by Professor Alexander B. W. Kennedy, F.R.S.; also "On the value of the Steam Jacket," "Proceedings of the Institute of Mechanical Engineers," 1890-91-92.

For the cylinder liners hard fine-grained cast iron is generally used instead of steel, which was preferred till within the last few years; in this way greater facility of construction is obtained, with more uniformity of metal in the cylinders. The free expansion of the liners is obtained by fitting either packing and a compressing ring at one end between them and the cylinder shell, or by a copper expansion ring of the usual form secured to each.

Elastic Packing for Pistons.—The friction between the metallic surfaces of the piston and cylinder walls forms a considerable part of the total friction of the engine, and, for this reason, various means have been tried in order to reduce it. Lubrication with oily substances is not of much importance, as it is injurious to the boilers, so that it is well to avoid its use in the cylinders and rely entirely on the humidity of the steam for internal lubrication; for this reason every effort is now being made to find an elastic packing material, of such a quality that while it insures the steam tightness of the piston it reduces the friction between it and the cylinder to a minimum. As regards the quality of the material for the packing rings, good close-grained cast iron is almost universally employed; Perkins' metal gives very good results, and the packing rings of high pressure

cylinders are often made of this material; in the French navy, anti-friction metal is also used in conjunction with the cast-iron packing rings, but this plan has not yet been used in our navy. On the construction of metallic packing for pistons and its necessary qualities, Mr. Mudd read an interesting paper at a meeting of the Institution of Naval Architects in 1891, in which he shows, with good reason, that the elasticity of the rings is generally sufficient to produce contact and steam tightness of the surfaces, and that it is a mistake to force this contact by means of additional springs. He shows also that the steam which inevitably finds its way to the back of the rings produces an excessive pressure between them and the walls of the cylinder, which it is well to avoid. With this object he fits two piston rings of uniform square section, 2 in. thick, held tightly against the surfaces of the piston and junk ring at top and bottom by strong spiral springs (Fig. 31), and in this way the pressure of the steam at the back of the rings tending to press them against the cylinder is greatly reduced. The section of the rings is constant, whatever the pressure of the steam and diameter of the cylinder may be, which is a great advantage in renewing these parts, as in all cylinders of equal diameter the rings are interchangeable.

I think it may be useful to quote some portions of Mr. Mudd's paper, as it will show better in his own words the principles on which he designs his piston packing. After remarking on the various systems of packing in vogue, and on the fact that whatever they are it is impossible to prevent the steam from penetrating to the space behind the rings, he very justly observes that the pressure of the steam greatly influences the behaviour of the rings, so that those of a certain form, which work well in a cylinder at low pressure, may not give good results in a similar cylinder working at a higher pressure, but, on the contrary, it is possible, and it also occurs in practice, that a ring which is satisfactory in a cylinder working at high pressure will be also good for a lower steam pressure. He says: "If it were possible to insert an indicator behind the metallic piston ring, we should obtain a curve of pressures similar to the figure 8 placed horizontally, the maximum ordinates of which would approach nearer to the maximum pressure in the cylinder in proportion to the freedom of entrance of the steam in the cylinder to the space behind the rings; and the more perfect the contact of the surfaces of the ring between the piston and junk ring, that is, the more difficult the passage of the steam between these surfaces is, the flatter will be the curve of pressures, or the more it will approach a horizontal line, so that in the best conditions we shall have a constant pressure somewhat inferior to the maximum pressure of the steam in the cylinder. Recognising this fact, nothing seems more absurd than to increase this pressure by means of strong springs behind the rings; the principal office of the springs of an elastic ring should be to diminish the pressure on the walls of the cylinder due to the pressure of steam behind the ring, or to diminish this latter pressure. The latter is perhaps the easier, and is obtained by my system of fitting these springs, but, in order that the pressure on the cylinder walls may be

increased if necessary when the rings become worn, they have recesses at the back in which springs may be fitted for this purpose (Fig. 31, c), an advantage in this arrangement being that the springs are the same for all cylinders." Ramsbottom elastic rings of Perkins' and other similar metals are much in favour, fitted not to the piston itself but to a fixed ring similar to an ordinary packing ring, so that it can be easily removed for the purpose of dismounting the Ramsbottom rings without removing the piston (Fig. 32). This arrangement, which is now adopted for engines of recent construction in our navy, is a very good one, as the rings can be changed as easily as in the case of the ordinary piston packing.

Piston-rod Packing.—Until within the last few years, at least in our navy, piston-rods were packed with asbestos or "Tuck's" packing, but metallic packing is now used with great advantage, both in economy and in the efficiency of the engine, as this packing is not only very durable but rarely requires to be touched. There are various kinds in use, and in our navy, more or less experimentally, the following:—1st. Metallic fibre, "Duval" system, which has given good results in some of our ships; for example, in the "Piemonte" for the low-pressure piston-rods, and in the "Affondatore." It is used in the same way as Tuck's packing with a turn of "Tuck's" under the gland, or the outside gland, if two are fitted. 2nd. Marshall's packing (Fig. 33), which has given excellent results in the "Piemonte," "Stromboli," "Fieramosca," "Bausan," "Rapido," "Volta," "San Martino," and "Europa." In this system, the annular segments of which it is composed are enclosed, an easy fit, in a sort of cylindrical box, so that the gland cannot exert any pressure tending to force them against the rod, the requisite pressure being obtained by elastic spiral ligatures, which embrace the segments of the rings. In this manner the packing is perfectly free to follow the slight lateral displacements of the rod in its motion, whilst it is kept in close contact with it; a turn of Tuck's packing is used with it as mentioned above in the Duval system, as it tends to make the pressure of the gland more uniform and less rigid. The segments of the rings are made of a special bronze in this packing, and last a long time, much longer than the Duval packing. The "Piemonte," which has been in active service for four years, still has her original packing in place. There are also metallic packings formed with annular segments of trapezoidal section and of anti-friction metal (Fig. 34) which have been fitted on the "Marco Polo" and some other small ships, but one cannot say they have been tried as yet in our navy. There are also other descriptions of metallic packing in use in merchant ships, &c., but they do not differ materially from those described; the system is being extended to nearly all the packing glands of the engine, and there is reason to believe that the friction is less than with ordinary packing.

Slide Valves.—Piston valves have been much in vogue during the last few years, because it is thought that being in equilibrium the friction is very small, but the friction depends very much on the manner in which the elastic packing rings are fitted, and is more

than anything an unknown quantity. Besides this the clearance spaces are much larger with piston than with flat valves, and they do not admit of the subdivision of the admission ports, whence their employment is limited to the high-pressure cylinder, where the clearance spaces are not of so much importance, and the sub-division of the ports not so useful as in the intermediate and low-pressure cylinders. Flat valves are balanced by compensating rings at their backs, to relieve the pressure and consequent friction on the slide faces; the methods adopted are well known. One of the difficulties in modern fast-running engines, especially in those of large size, is due to the inertia of the valves, and their rapid alternating movements; everything has been done to make them as light as possible, but this is not sufficient, the strains on the working parts being very great, and such as to occasion constant wear and risk of overheating. Mr. Joy has succeeded in eliminating this force of inertia, or rather its action on the working parts of the valve gear, by applying a special balance cylinder and piston to the upper end of the slide rod (Fig. 35), by means of which the movements of the valve are aided and retarded in such a way as to take all the strain off the eccentric rods and other parts, which merely serve to regulate the movements. These balance cylinders have been fitted to the engines of the "Aretusa," and will be fitted to all engines in course of construction.

Main Condensers.—Mr. Mudd has found it advantageous to suppress a good many of the condenser tubes in vertical columns, forming ample passages for the steam to penetrate rapidly amongst the tubes at all points (Fig. 36); in this way greater efficiency is obtained with a not inappreciable saving in weight. I have already mentioned that Mr. Schichau divides the condenser into two parts, the upper chamber serving to heat the feed water and the lower being the condenser proper; I have also indicated the advantages of this arrangement, which appears to me to merit a more extensive adoption.

Air Pumps.—It had become the fashion to use air pumps, driven by independent engines, in order to have the means of maintaining the vacuum in the condensers when the engines were stopped, and with the advantage that a large volume of steam could be discharged into the condensers direct from the boilers in case of sudden stoppage, thus rendering the boilers more independent of variations in the speed of the main engines. These advantages for the engines of war ships, subject to frequent changes of speed and sudden stoppages, were very important, and such as to justify the favour with which these independent air-pumps were first received. Their action, however, by reason of the great variations in the work thrown on them when the speed of the main engines was varied, or when priming occurred, was very irregular, and they required constant attention, the pumps being liable to stop, with great risk of injury to the main engines. Many expedients were tried with the object of insuring the continuous and regular working of the air pumps, such, for example, as the adoption of double cylinder engines, to get rid of dead points, and the use of governors; but with all this no satisfactory solution of the difficulty has yet been arrived at, and there still remains the

large amount of care and vigilance which these pumps require as compared with those worked directly off the main engines, and for this reason the latter arrangement is almost always preferred in modern practice. In our navy, for instance in the engines in course of construction for the "Calabria," the armoured cruisers of the "Carlo Alberto" type, and the ironclads of the "Ammiraglio Saint-Bon" type, in order to combine the advantages of the independent air pumps with those of the air pumps worked off the engines, both systems are employed for each engine, the principal pump being worked off the main engines; and the other secondary, or auxiliary air pump, being worked by the circulating engine. The latter being constantly in motion, even when the main engines have been temporarily stopped, maintains the vacuum in the condenser, keeps it free from the water formed by the condensation of the steam from the silent blow-off, and preserves the continuity of the feed without the necessity of taking other steps to this end. Experience will decide whether this arrangement, which would appear to be a good one, really is so or otherwise.

(*To be continued.*)

GERMAN INSTRUCTIONS FOR FIELD FORTIFICATION, 1893.

(Translated from the "Militär-Wochenblatt.")

THE effect of the introduction of the most modern firearms has been to give field fortifications an increased value. Field fortification is no longer an art confined only to one single arm, but forms an important factor in the education of all arms alike.

This at least is the idea conveyed to us, both in the introduction to the German "Felddienstordnung," and in the "Feldpioniervorschrift für die Infanterie," which appeared some three years ago.

In Part II of the latter were given the tasks in field engineering connected with the construction of siege works; whilst in Part III the subject of the employment of infantry in trench works was thoroughly gone into.

Such radical changes, however, have recently taken place in both these matters that it has been found necessary to issue fresh instructions for carrying out such technical operations as may be required in the artificial strengthening of a position. Hence the issue of the "Feldbefestigungsvorschrift," which, according to the Imperial order authorizing its introduction, is to be the text-book for the future, and is to supersede all previous directions.

The pioneers are to be practised in all the exercises prescribed in the new regulations, while the infantry will receive instruction to the same extent as heretofore.

The *general principles* of field fortification are, in Part I of the new regulations, dealt with far more comprehensively than they were in the "Feldpioniervorschrift für die Infanterie." The language is terse and precise, as is now the case in all official publications, but, in addition to considering the object and mode of employment of field fortifications, the choice of a defensive position is also taken into consideration, since this bears upon the handling of the troops and, for the latter, tactical considerations must always hold the first place; the technical requirements must, under all circumstances, adapt themselves entirely to the tactical, and must consequently necessarily be subservient to them. The assistance given by the instructions in the choice of a defensive position will be gratefully welcomed by all arms, as the choice of a good position is far from being an easy matter.

The arrangement of field fortifications is also dealt with on general principles; in connection with this it is stated pointedly that the formation and occupation of advanced posts is, as a rule, not to be recommended. The question of artillery positions is next dealt with. The chief requirements of an artillery position are—in addition to

an extended and clear field of fire on a front as far as possible at right angles to the principal direction of fire—level gun-platforms within the battery, a sufficiency of space, and ability to sweep with fire the whole of the ground up to close range.

For the first time also in a work of this nature, as far as we are aware, reference is made to the heavy batteries of foot artillery, whilst such field fortifications as are required in fortress warfare have also not been omitted.

Included under the heading of general principles are the manner of employment of troops in fortifications, the tools available, and the amount of work that can be done by men in a given time, and under given conditions. All unnecessary figures are carefully omitted, and where more detail is required it is given separately in appendices, as, for instance, the tables of intrenching tools in Appendix I. These tables contain the detail of intrenching tools carried in the field by infantry battalions, cavalry regiments, field and horse artillery, pioneer companies, the pioneer detachment of a cavalry division, and the bridge trains of a division and of an army corps.

Part II contains the *execution of field fortifications*, and explains the various natures of shelter trenches and cover which may be employed to suit the nature of the ground. The dimensions, both in the letter-press and in the plates, are now once more given in metres, which we prefer to the old system of giving the dimensions in spade-lengths and half spade-lengths. It is ridiculous to assert that the private soldier of the present day does not know what is a metre or a half-metre, for the metric system has now entered into the very flesh and blood of the nation, and everyone is now able to correctly make any measurements that may be required. The retention of the terms *knee-high*, *fork-high*, and *breast-high* is, however, sound.

Speaking generally, the shelter trenches take the form of trenches for men kneeing or standing, but there are also improved shelter trenches, with thickened parapets, intended for men firing standing, and at the same time providing covered communication behind the firing line. Cover to the rear is done away with, owing to the increased effect given to the fragments of high-explosive shells bursting there.

In the "Feldpionervorschrift für die Infanterie" were to be found certain measures considered necessary for obtaining rapidity in the arrangement and execution of the work, such as the words of command "Advance tools," "March on the alignment," "Step back," "Commence," all of which find no place in the present work. We may therefore conclude that these words of command have now been abolished, and, as a matter of fact, they were quite unnecessary, just as it was also unnecessary to go too much into detail as to what each man would have to do on the order being given. Shelter trenches cannot be made in the field with such exactness as is required for a conjurer's trick, and the much-turned-over practice-field, where possibly this exactness might be obtained, is not quite the same thing as the natural surface of the ground. In the abolition of these details a marked improvement is to be observed.

The portion dealing with the provision of overhead cover for shelter trenches, &c., treats of this subject far more fully than does either the "Feldpioniervorschrift für die Infanterie," or the still older "Pionierhandbuch," and here, again, is a decided improvement. In each form of construction special attention is devoted to simplicity: all elaboration—which is so likely to lead to trifling (*Spielerei*)—is carefully avoided, the key-note of the work being to aim only at that which is practical. The directions are throughout such that no special technical knowledge is required for their execution, and any man of ordinary intelligence can easily carry them out. This is exactly what we require for the training of our men.

The various natures of cover for field artillery are dealt with fairly thoroughly, and explained by plates so simple as to be very easily understood; whilst those applicable to foot artillery alone are only referred to in general terms, the construction of cover for heavy batteries being explained in the special regulations for foot artillery.

The utilization of existing cover for purposes of defence is also treated of in a thoroughly practical manner. Figured dimensions are expressly avoided in the plates in this portion, but all the examples of the various natures of defensive works are based carefully upon the penetration of modern rifle bullets, which was not always the case in the "Feldpioniervorschrift."

Since closed field works are generally formed by the development of shelter trenches, a very short description of them is sufficient to answer the purpose, and accordingly only four paragraphs are devoted to this subject. Under these circumstances, it was of course impossible to furnish details as to the distribution of the men, the erection of the various profiles, &c., as was done formerly in the "Pionierhandbuch"; moreover, as the old form of work, with an outer ditch as an obstacle, has been abolished, they are no longer required. In a similar manner, the stiff and sharp-angled forms are no longer made use of; the normal shape must rather, as far as possible, conform closely to the natural surface of the ground, and any nature of work, however irregular it may be in shape, is justified, so long as it fulfills the requirements of providing good fire effect and cover.

Ditches will, in general, in field fortification, be excavated only with a view to obtaining earth for cover, &c., and never for the sake of providing an obstacle pure and simple. Obstacles will consist of walls, hedges, railings, bushes, water, &c., and more especially of those of an artificial nature, such as abattis of trees and branches, and wire entanglements. Among the latter, the fanciful elaborate form of wire entanglement, with rising and falling network¹—at one time so much in favour, and upon which, consequently, much time was wasted—has been done away with; more than that, it is laid down that the low wire entanglement may be made even lower than usual if it cannot otherwise be concealed from view.

According to the "Instructions," the main object of obstacles is to protect troops from surprise, and to detain the enemy within the

¹ This does not refer to what we know as "high wire entanglement," which is still retained in Germany.—TRANSLATOR.

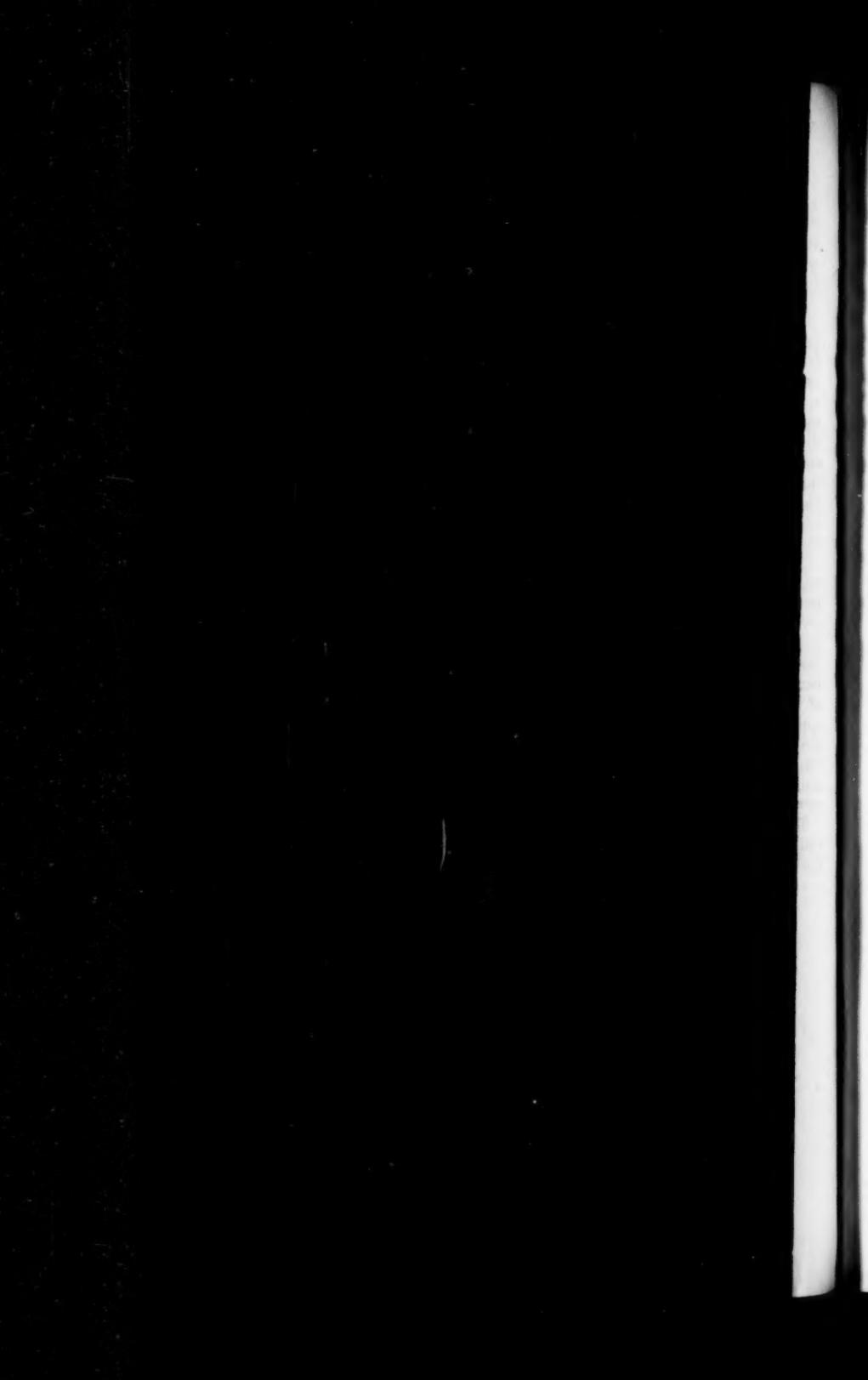
most effective range of fire. They should not impede the fire of the defenders, and must be, as far as possible, concealed from the view of the assailant. It follows that obstacles must in all cases be placed within effective range of the defence, as otherwise they would not fulfil the objects required of them.

Part III deals with the works to be carried out by infantry and pioneers in an attack on a fortress, and, after stating a few general principles, describes the nature of the trenches, their mode of construction, and the manner in which they can be widened, as also various other matters in connection therewith. In other words, it treats of the construction of the infantry positions, approaches, &c. right up to the position from which the final assault is delivered. The plate shows also that stiff and regular forms have been abolished, and that advantage is now taken of the features of the ground, and of the cover afforded thereby. This part concludes with an account of how to remove or overcome obstacles, including pits, palisades, harrows, &c. Nothing special is laid down as to the construction of these last-named obstacles.

A mass of information, indispensable in the execution of field works, is given in the appendices, including the thicknesses in metres of various materials required for cover. Details are also given of various natures of revetment, including the construction and mode of employment of fascines and hurdles for revetting. The gabion is altogether abolished in field fortification, but, on the other hand, the use of iron has been introduced, and a description is given of how to obtain cover by making use of corrugated iron. The last appendix contains the instructions for sapping, and applies solely to the pioneers. In this matter also the greatest simplicity has been introduced, the old cube sap having been replaced by the traversed sap. In sapping, infantry will only be employed to assist in widening the trenches.

These "Instructions" form another valuable addition to our excellent text-books, and will be equally appreciated by all arms of the Service.

(100.)



NAVAL AND MILITARY NOTES.

NAVAL.

Home.—The Manœuvres were brought to a conclusion on the evening of the 4th August, two days before the time laid down in the original programme. Although the report of the umpires has not as yet been published, it seems clear that success remained with the Blue or defending fleet, under the command of Rear-Admiral FitzRoy. When Admiral Fairfax, in command of the Red Fleet, failed to prevent the junction of the two divisions of his enemy, his chances of obtaining the command of the Irish Channel, which was necessary to enable him to carry out the object assigned to him, were practically gone. It is stated, on behalf of the Red Fleet, that Admiral FitzRoy, with his division, would have been overwhelmed on the afternoon of the 28th, but for the opportunity coming up of a fog, under cover of which he evaded the now combined Red Fleet and effected his junction with his own 2nd division at daybreak the following morning, with the result that the battle which ensued was a drawn one. Fogs, however, whether opportune or the reverse, are among the chances which have to be faced, and we only have to do with the fact that Admiral FitzRoy was not intercepted, and that after the indecisive action next day he ranged up and down the Irish Channel without interruption, and the second battle between the two fleets off Cardigan Bay on the forenoon of the 4th seems to have been as indecisive as the first.

It remains to be asked then, what has been learnt from this year's Manœuvres? It is not our intention to discuss questions of strategy, but we may draw attention to two points which have come prominently into notice, both of which hinge more or less on each other, and both of which are of the first importance.

The first is the complete collapse and utter uselessness for the purpose for which they were constructed of the 1st class torpedo-gun-boats, as they are called now, but which were designed and built as torpedo-boat catchers. For many years past there has undoubtedly prevailed among certain experienced officers of the old school, an opinion that torpedo-boats and torpedo-boat warfare are not for a naval Power like England; torpedo-boats are all very well, we have been told, for smaller Powers, who have to stand on the defensive, but we must rely upon torpedo-catchers, by means of which we can bid defiance to the torpedo-boats and drive them ignominiously from the sea. Rightly or wrongly, the Admiralty have been credited with holding the same view, and this, at least, is certain, that for the last few years our torpedo-boat construction has practically stood still, and instead of being first we now stand only fourth on the list as far as 1st class torpedo-boats (that is boats of 101 ft. and over) are concerned: France alone possessing 185 of these to our 93, and having 27 under construction to our 16, including the six new destroyers of the "Havoc" class; while we have instead 30 vessels built as torpedo-boat catchers, not one of which, apparently (except the old "Rattlesnake," the first of the class, and, perhaps, the "Speedwell"), can be depended upon to keep up a decent speed, much less overtake a torpedo-boat; and it must be remembered that our torpedo-boats (excluding the 10 new ones under construction) are far inferior in speed to the boats which have been built during the last two or three years for France, Italy, Russia, and Germany. The six (we are promised 14 eventually) new type so-called torpedo-destroyers, of which the first, the "Havoc," was launched from Messrs. Yarrow's yard the other day, are to have a speed of 27 knots, or, we should rather say, that is the speed promised by the Constructor's Department; but, in view of the lamentable failure in the calcu-

lations up to the present of the speed of this class of vessel already built for our navy, it will be as well to await the result of their trials, and even if they do attain the stipulated speed it must be remembered that the Schichau firm have already built torpedo-boats for Russia and Italy which, with all their stores on board, in the open sea, maintained the high speed of 27·4 knots, while the contract speed of the new type of boat building by the Normand firm for the French Government is to be 30 knots; so that our new destroyers are already outpaced, before they are even launched. The Italian torpedo-aviso's of the "Nibbio" type, designed and built by the Schichau firm, of which there are five, and two others under construction, have a speed of over 26 knots; they are somewhat smaller and of less I.H.P. than our new "Havoc" class, so we will hope that the anticipations of our Constructor's Department with regard to the latter will be realized, and that at the next Manœuvres there will be an opportunity of proving their value.

The second point, which is one of the marked features of this year's Manœuvres, and we are particularly pleased to note it is, that the torpedo-boats have scored some notable successes. Of course we are told that the officers in command of the torpedo-boats were young and rash, and that they did not play the game fairly, that they often attempted the impossible, and over and over again in real war they would have been sunk before arriving near enough to discharge their torpedoes. We have no doubt that a good deal of that is true; but, on the other hand, it seems to us that the claims of ships to have sunk the torpedo-boats wholesale by their fire must also be received with a certain amount of reserve; there is, of course, no means of testing; but, judging from what often takes place at ordinary target practice, the chances are that in the hurry and excitement the fire would not have been sufficiently accurate to prevent some at least of the boats from running the gauntlet successfully. We believe that the bulk of the younger officers in the Service, who will have to fight our battles in the future, are not by any means of opinion that torpedo-boats should be suppressed in favour of the "catcher," but that, on the contrary, there is a great future before the torpedo-boat, as a weapon of offence as well as of defence. How torpedo-boats should best be employed, whether they should act independently, in twos or threes, or in swarms, as our neighbours the French are so fond of employing them, is another moot point. As, during the week the Manœuvres lasted, the torpedo-boats were practically acting independently, it seems a pity that, before the fleets broke up, the boats were not concentrated into one flotilla, and allowed to make a grand attack upon a subdivision or certain ships of the fleet, which might have been detailed to blockade or patrol certain parts of the coast. The French are great believers in employing torpedo-boats in swarms, rightly holding that although a ship or ships may keep two or three or half a dozen boats under fire it is impossible to keep 20 or 30, and that if the boats are boldly and skilfully handled and once reach the ships, they are pretty sure to leave their mark behind them. The French devote a great deal more time and trouble to torpedo-boat operations than we have ever considered necessary; not only during the Grand Summer Manœuvres, but all the year round, the torpedo-boats of the "Défense Mobile" of the different ports are kept hard at work, the opportunity being taken nearly every time the French squadrons go to sea of attacking them by the torpilleurs. During the late French Manœuvres, 72 torpedo-boats were commissioned and complete for service, 48 being employed in the Mediterranean and 24 in the Channel.

In Italy, 28 torpedo-boats are taking part in this year's Manœuvres, and the same number in Germany. In England we have no regular torpedo-boat organization, and this year's Manœuvres would seem to show that neither have we any torpedo-catchers worthy of the name, although it is on our "catchers" we are supposed to rely as our weapon to neutralize the torpedo-flotillas of other nations, if we should find ourselves at any time engaged in hostilities with them. On the other hand, it is satisfactory to note that the cruisers seem to have done well and to have been able to maintain without difficulty a good working speed; this has especially been the case with the new 2nd class cruisers, while the "Blenheim" appears to have come up to all the expectations which were formed of her, and to have been a great success, rendering invaluable assistance to the A fleet in scouting duties.

It is worthy of note that several of the foreign papers which take an interest in naval matters, in commenting upon this year's manœuvres, have not failed to draw attention to our weakness in torpedo-boats and the collapse of our torpedo-catchers.

The "Triumph" has arrived at Portsmouth from the Mediterranean with the survivors of the "Victorin's" crew. Her officers and crew have been turned over to the "Warspite," which takes her place as flagship at Queenstown. The 2nd class cruisers "Phaeton" from the Mediterranean and "Magicienne" from the West Indies have also arrived and paid off. The "Magicienne" has been recommissioned for further service in the West Indies by Captain Clarke, and returns to that station immediately.

The 1st class battle-ship "Empress of India" and the 1st class cruiser "Grafton" have been passed out of the dockyard hands into the A Division of the Reserve at Chatham, and are ready for commissioning. The "Havoo," the first of the new "torpedo destroyers," was launched on the 12th August from Messrs. Yarrow's yard at Chiswick.

Two new 1st class gunboats, to be called the "Torch" and "Alert," are to be laid down at Sheerness. The new vessels will have a displacement of 960 tons, with a length of 180 ft., a beam of 32 ft. 6 in., draught 11 ft. 6 in., and engines which will develop 1,050 I.H.P. under natural draught, and 1,400 I.H.P. under forced draught, giving a speed of 12·2 knots and 13·2 respectively. The armament will consist of six 25-pr. and four 3-pr. Q.F. guns.

The Admiralty have authorized the construction of two new docks at Portsmouth, and the work will be taken in hand immediately by contract. The new docks will be Nos. 14 and 15 respectively, and will be constructed on sites which have been marked out for them for some time on the new extension grounds; they will have a length of 600 ft., with a proportionate width, so that they will admit the largest battle-ship. The total estimated cost will be about £10,000.

No. 7 building slip at Chatham, known as the Alexandra Slip, is being widened, so as to admit of the construction of ships with a beam of 75 ft. The new 1st class battle-ship "Magnificent" is to be laid down on it.

A new and improved type of evaporating and distilling condenser, patented by the Kirkaldy Company, has been tested at Portsmouth Dockyard with satisfactory results, and has been favourably reported on, it is stated, by the Chief Engineer's Department. The complete apparatus weighs just under 1000 lbs., and is chiefly designed for the use of torpedo-boats, thus supplying a distinct want, as hitherto it has been found impossible to provide these small craft with light condensers. The new apparatus is able to produce about 5 tons of pure water in 24 hours, available either for feed or for drinking purposes. An excellent feature of the invention is its self-cleaning capacity. At the end of a 12-days' trial it continued to evaporate its maximum quantity under comparatively low steam pressure, and without any indications of scale being noticed.

Admiral Sir M. Culme-Seymour has shifted his flag to the "Sanspareil," which ship is to act temporarily as his flagship. It is reported that the 1st class battleship "Ramillies," a sister ship of the "Royal Sovereign," is to be the new Mediterranean flagship as soon as she is ready.

Austria-Hungary.—The naval Estimates show a progressive increase. In 1891 they reached a total of 11,550,941 fl.; in 1892, 11,635,934 fl.; and in 1893, 11,977,680 fl.; while the Estimates of 1894, which have been sanctioned by the Budget Committees of both Delegations, amount to 12,477,680 fl. Of this sum 2,565,000 fl. are assigned to the "extraordinary" estimates. Provision is made for but one new ship—the ram cruiser "C" (5,500 tons)—a first grant of 300,000 fl. being sanctioned towards a total of 3,500,000 fl. The new vessel is intended to

replace one of the obsolete "Prinz Eugen" type. She is expected to be completed by the year 1899, while two other similar ram cruisers ("A" and "B"), which are in hand, are expected to be delivered respectively in 1896 and 1898. Looking forward to the year 1899, it is not without interest to note that, according to present disposition, Austria will have eight battleships more than 20 years old (the youngest of which will be the "Tegethoff"), and that there will remain to her but eight others, the oldest of them being the "Kronprinz Erzherzog Rudolf" (12 years), with a total displacement of 41,400 tons. ("Army and Navy Gazette.")

France.—Vice-Admiral Vignes, Commander-in-Chief of the active squadron of the Mediterranean Fleet, and who has been in supreme command during the Manœuvres, has issued on their termination a memorandum, in which he expresses his high satisfaction with the way in which the ships of the large fleet under his command were handled at all times, and with the discipline and state of efficiency of the crews. He concludes by conveying his thanks to Vice-Admiral Boissoudy, the other Admirals of the squadron, and the captains and officers and men of the respective ships for the devotion and zeal they have displayed, which will be equally appreciated by the Minister and the country. ("Petit Var.")

Some new signalling experiments have been carried out by the two divisions of the Channel Squadron, which consisted of using inclined mirrors fitted to the electric light projectors, but it is believed without any practical results. ("Riv. Marittima.")

We omitted to mention the launch on the 1st June last of the submarine boat "Gustave Zédé," at Toulon; she is 266 tons and 720 H.P., her propellers are driven by electricity, she has two torpedo-tubes, and will carry a crew of eight men; another similar boat, to be called the "Morse," is also in hand. In the latter end of June the new torpilleur-de-haute-mer "Chevalier" was launched from the yard of M. Normand, at Havre; she has a displacement of 123 tons, engines of 2,000 I.H.P., and an estimated speed of 26 knots. The new 2nd class cruiser "Suchet" was launched at Toulon on August 10, the torpedo-catcher "D'Iberville" at Saint Nazaire on the 26th, and the 1st class battle-ship "Charles Martel" at Brest on the 29th. We shall give details of these ships in future issues.

The 1st class armoured cruiser "Dupuy-de-Lôme" has made a trial under forced draught; she only developed 12,500 I.H.P. instead of the estimated 14,000, the speed attained being 19·6 knots. It is, however, hoped that at the final trials the full power will be obtained, and a speed of over 20 knots. ("Le Yacht.")

The new torpilleur-de-haute-mer "Mousquetaire" has concluded her steam trials at Cherbourg with very satisfactory results. She made three runs on the measured mile, and averaged 25·4 knots, but the mean of the whole trial was reduced to 24·7, in consequence of the unfortunate fracture of one of the steam joints, which caused the pressure to be reduced; the contract speed was to be 24·5 knots, which in this case again, as in all the later torpedo-boat trials, has been considerably exceeded. The "Mousquetaire" is 154 ft. long, 15·7 ft. beam, has a displacement of 125 tons, with engines of 2,100 I.H.P. Two smaller boats, Nos. 178 and 179, have also completed their trials; the first averaged 23 knots, and the latter 24 knots, the trials of all three being made at normal draught. ("Le Yacht.")

The trials of the "Magenta" have been temporarily interrupted. On August 17 she left Toulon for a 20 hours' trial, but during the afternoon an explosion occurred in one of the boilers, by which eight men were scalded, three seriously; the ship therefore returned to harbour. ("Petit Var.")

The experiments with liquid fuel are still being continued. No. 139 torpedo-

boat has had the necessary modifications carried out for the employment of the fuel. The trials of the mixed fuel in the "Forbin" are expected to give very satisfactory results; special apparatus is being tried in connection with the experiments, the object of which is to give warning of any overheating of the bearings due to the increased speed of the engines by the augmented power. At Marseilles some experiments have been carried out on some steam tugs with briquettes of solidified petroleum invented by Lieutenant de vaisseau Maestracci. It appears that satisfactory results were obtained, as the same weight of fuel gave out three times the heat of ordinary coal without any smoke, and with very little alteration to the furnaces. ("Riv. Marittima.")

Provision was made in the Estimates of 1893 for two new swift long-range cruisers, larger than any yet built for the French navy. The contract for the first has been given to the "Société des Forges et Chantiers de la Méditerranée" at La Seyne, and her construction has now been commenced. Her designs are by M. Legane, the constructor of the Spanish battle-ship "Pelayo," the Chilean armoured ship "Capitan Prat," and some other celebrated modern vessels. She is to be named the "D'Entrecasteaux," after the famous French navigator (1740—1793), who conferred his name upon the island groups in the Louiniade Archipelago, and who died during his search after La Pérouse, and, as she is intended for service as flagship in distant seas, she will be sheathed and coppered. Her dimensions are as follows: Length, 393 ft. 6 in.; beam, 58 ft. 5 in.; displacement, 8,114 tons; and her extreme draught, 29 ft. 6 in. She will have two vertical triple expansion engines, developing under moderate forced draught 14,000 I.H.P., supplied by five return tube boilers working at a steam pressure of 140 lbs. to the square inch, which is to give a speed of 19 knots at a consumption of about 26 lbs. of fuel per square foot of grate area. Her normal coal stowage will be about 650 tons, but it will be possible to carry 1,000 tons. Apparently, there is to be no vertical armour-belt, the protection being provided by two armoured decks, the lower with sloping sides 4 in. thick, and the upper 8 in. thick, the two decks forming a large cellular caisson, divided into a great number of compartments, which will be filled with reserve coal and stores. Nearly the whole of the hull below the protective deck will be occupied by the engines, boilers, and magazines, and each of the heavier guns will have its own separate ammunition hoist. These, and also all the auxiliary machinery, steering gear, lighting, loading, and training gear for the turrets, &c., will be worked by electricity, and all the auxiliary apparatus and electric machines will be placed below the protective deck. Her armament will be composed of two 9·4-in. guns, 40 calibres long, which will be mounted in turrets, one forward and one aft, protected by 10-in. steel armour; twelve 5·5-in. Q.F. guns, four of which will be on the spar-deck, two bow and two stern chasers, protected by 2·8-in. hardened steel shields, and the remaining eight will be in the central battery on the main deck behind similar shields, and mounted in sponsons, so that they can fire in line with the keel; each of these guns will also have its own ammunition hoist; twelve 1·85-in. Q.F. and four 1·45-in. Q.F. guns, which will be distributed over the superstructure and in the tops, of which there will be three—or, rather a three-decked one—on each of the two military masts. Within the masts will be the usual staircases and fighting positions, and there will be a heavily armoured conning tower and various other protected posts of command and observation. The "D'Entrecasteaux," which is estimated to cost £20,000, will be somewhat larger than the new 1st class cruisers of the "Edgar" class, but a little smaller than those of the "Blenheim" type. She will also be exceeded in size by the Russian cruiser "Rurik," than which, however, she will be 1 knot faster. In size she will most nearly approximate to the new American cruiser "New York." It is not yet settled when the second ship of the same class is to be laid down. There are two 2nd class cruisers also included in the programme under construction, named the "Du Chatay" and the "D'Assas," and a torpedo-cruiser, the "Casabianca," of a somewhat larger type and higher speed than the "D'Iberville," just launched. ("Times" and "Riv. Marittima.")

It is said that the electric elevators for the ammunition service of the 1st class

cruiser "Alger," do not work well; also that there is no proper room for the ammunition of the new quick-firing guns placed on board, and that long lengths of slides and trolleys have to be resorted to for the transport of the ammunition, arrangements which would be all knocked in the air at the first shot in action. It is also reported that the electric steering arrangements do not inspire much confidence, and cannot be depended upon in any important evolution. ("Riv. Marittima.")

Four "broadside submerged torpedo-tubes" have been ordered of the "Forges et Chantiers de la Méditerranée" for the "Lazare Carnot" and the "Jauréguiberry" ironclads, from the design of M. Canet, and it appears that the "Charles Martel" will also be supplied with them. The French engineers hope to obtain better results than have been obtained by the English, as it seems that some fractures of the bar have occurred at high speeds in England. ("Riv. Marittima.")

Germany.—A terrible accident occurred on the 2nd August, on board the battleship "Baden," which was engaged in target practice at Friedrichsort, near Kiel. From some unexplained cause a charge exploded prematurely, killing 2 lieutenants and 7 men, and wounding 18 others. Prince Henry of Prussia, with Admiral Schroeder and other high officers, was on the forebridge at the time. The "Baden" is an iron battle-ship of 7,280 tons, and was launched at Kiel, in 1880. She is one of four similar vessels, and carries six 26 c. m. (10 $\frac{1}{2}$ in.) 18 ton guns, as well as four 4·2 in. Q.F. guns, two 6 pr. Q.F. guns, and 6 machine guns, with 4 torpedo tubes. Two of the large guns are mounted in a barbette turret forward, and the four others *en barbette* at the angles of a square armoured citadel, which lies just abaft the funnels. The fore turret is protected by 16 in. armour, the citadel and after barbette by 10 and 6 in. armour; before and abaft the citadel is a 3 in. armoured deck. It was a 26 cm. charge for one of the guns in the fore turret which exploded. The projectile was jammed in the bore, and great difficulty was experienced, and great care and extraordinary precaution had to be adopted before it was found possible to remove the shell, which after the explosion still remained firmly fixed in the bore. Elaborate preparations were made, the rents in the bore were covered over with iron plates firmly secured, and the gun was fenced round with a sort of rampart of stones, sand bags, and thick oaken beams. When all was ready the ship steamed to sea, the men were sent below out of danger, and the gun fired by electricity from the engine-room. On examination, after the gun had been fired, it was found that no further damage had been done to it, but the shell had only been moved a few inches. The gun was then fired a second time with a larger charge, but with the same result. A full charge was next tried, and wedges were driven into the rents in the gun; this time the attempt was successful, and the shell whizzed away seawards, exploding as it struck the water.

The final trials of the Imperial yacht "Hohenzollern" took place a short time before she brought the Kaiser to Cowes, and the results have been officially made public. It appears that during six hours' run, with but slight air-pressure, the machinery developed 9,460 I.H.P., being 460 H.P. more than was expected. With her full coal stowage on board, she averaged a little over 21 knots per hour, and with half her coal supply 21·8 knots per hour. During twenty-four hours' continuous steaming a speed of 19·5 knots an hour was maintained without the slightest difficulty or strain either upon the engine-room staff, boilers, or machinery. ("Marine Rundschau.")

With the view of affording greater relaxation to the engine-room staffs, when off duty, a large number of net-hammocks have been supplied to all the ships of the Manœuvre Squadron this summer, for the use of the stokers, &c. ("Marine Rundschau.")

The naval manœuvres commenced on 20th August. The scene of operations will be principally in the Baltic, but some manœuvring has been carried out in the neighbourhood of Heligoland, the general idea having been to repel the attack of a hostile fleet coming from the north. The manœuvres will terminate with a grand attack

on Kiel, which will be defended by a special squadron and the coast fortifications, on September 23, after which the Reservists will be dismissed to their homes. The evolutionary fleet is now constituted as follows, under the command of Vice-Admiral Schroeder, who has his flag flying in the "Baden." First division :—

Battle-ships—"Baden" (flag), "Bayern," "Sachsen," "Württemberg."
Despatch-vessel—"Meteor."

Second division, under Rear-Admiral Karcher :—

Battle-ships—"König Wilhelm" (flag), "Deutschland."
Coast defence—"Beowulf," "Frithjof."

Despatch-vessel—"Jagd."

Third division, composed of training ships under command of Rear-Admiral von Pawelsz :—

Wooden frigates—"Stein" (flag), "Stosch," "Moltke," "Gneisenau."

Fourth division, mixed, under command of Rear-Admiral Thomsen :—

Battle-ship—"Friedrich der Grosse" (flag).

Torpedo dépôt ship—"Pelikan," which has been armed with Q.F. guns.

Cruised corvettes—"Olga" and "Carola."

First torpedo-boat division, under command of Captain Schmidt :—

Aviso "Wacht," division boats 7—8, and 12 torpedo-boats.

Second torpedo-boat division, under Captain Zerje :—

Aviso "Grille," 2 division boats, and 12 torpedo-boats.

The so-called division boats act as flagships to their divisions, each of which consist of six boats. The division boats 7 and 8 were built in 1890, have a length of 213 ft., are of 350 tons displacement, with engines of 4,000 I.H.P., and a speed of 26 knots; they carry three torpedo-tubes and six small Q.F. guns.

Admiral Baron von der Gohr has hoisted his flag on board the gunnery training ship "Mars," and is in supreme command of the operations.

Italy.—The "Rivista Marittima" publishes in the July number an excellent photograph of H.M.S. "Victoria," and a notice of her loss, mounted in black, expressed in the following terms:—"Perhaps the hand of Admiral Markham, the brave Arctic explorer, trembled for the first time while writing the telegram (of 23rd June last), for however accustomed one's mind may become to unfortunate or disagreeable surprises, and to the alarming disasters with which the sad chronicles of the sea abound, it is not possible to take part unmoved in such a calamity as that which the ram of the 'Camperdown' has inflicted on the glorious navy of England. For that rich and powerful nation the loss of the ship is a far less serious matter than to learn that a distinguished Admiral and a large body of brave men had been overwhelmed without adding anything to the glory of the Cross of St. George. It is a hard fate to die in such a way, but in the uncertainty of the seaman's life, which for some cause or other is a perpetual battle, this defeat has always in itself something touching, grand, and inspiring. We bow ourselves reverently to the memory of the noble Admiral Sir G. Tryon, who sacrificed his life in the fulfilment of his duty, and to the memory of the brave officers and ship's company of the 'Victoria' who perished with him."

Prince Henry of Prussia has been witnessing some of the manœuvres of the Italian fleet, having been the guest of the King on board the royal yacht "Savoia." The King and Prince were present at a review of the fleet in the Bay of Naples, on the 17th August, which took place after the first part of the operations had concluded, and they subsequently followed the second part, which were brought to a close on the 23rd, when the royal party left for Spezzia, where they disembarked. Although stringent orders were given that no correspondents were to be allowed with the fleet, general account of the operations up to the present seems to have found its way into some of the papers. The programme has been divided into three parts, each dealing with a different phase of operations. During the first part the attacking force, under the command of the Duke of Genoa, was to attack the coast, bombarding the coast towns, destroying railways, and cutting communications, cables

and telegraphs, &c., bringing about an action with the defending force if possible. The defending force being the weaker, while refusing an engagement, was to follow and harass the enemy, and, with the assistance of the torpedo flotillas attached to each principal harbour, to prevent it attaining its object. In the second part, the defending force, blockaded in the Bay of Gaeta, finds its position untenable, and endeavours to escape to a harbour too strongly fortified for the enemy to approach. In the third part, the attacking force is to endeavour to convoy a fleet of transports from the west coast of Sardinia to the Roman coast, and attempt to land an army corps.

The manœuvre field is the Tyrrhenian Sea, the west coast of Sardinia to form the base of operations for the attacking fleet, the north-east portion of the island and Maddalena being included in the national territory. Commenting on the theme of the manœuvres, the "Italia Militare e Marina" points out that the rôle assigned to the attacking squadron is precisely that foreshadowed for a French squadron, in the case of war with Italy, by Commandant Z... and H. Montéchéant in their work "Guérres navales de demain."

The first part of the operations began on the 9th August, continuing to the 14th; the second, beginning on the 17th, concluded on the 23rd; while the third, beginning on the 27th is to conclude on the 6th September. In addition to the ships given in the August notes, 11 torpedo-boats have been commissioned at Spezzia, 7 at Maddalena, 4 at Gaeta, 3 at Messina, and 3 at Taranto, for the manœuvres.

The 2nd class protected cruiser "Lombardia" has completed her forced draught trials. The machinery worked splendidly and the engines developed 7,140 I.H.P., being 640 H.P. in excess of the contract. Unfortunately the cruiser's bottom was very dirty, so that a speed of only a little over 17 knots was obtained in place of the 19 this class of ship is expected to steam. The "Lombardia" is a sister-ship of the "Calabria," "Etruria," and "Liguria"; the dimensions, &c., of the "Liguria" were given in the August number of the Journal.

Japan.—The Elswick firm has for some years now carried off the palm for speed in fast cruisers, and the trials of the new protected cruiser "Yoshino," built for this Government, which took place off the Tyne during the early part of July, have added fresh laurels to the reputation of Mr. Philip Watts, the able head of the Constructive Department of the Company, and his staff. The "Yoshino" is of a similar type to the "9 de Julio" and "25 de Mayo" built for the Argentine Government, both of which in turn have been the fastest cruisers afloat, but this place must now be given to the "Yoshino." This cruiser is somewhat larger than the two vessels above-mentioned, but she is provided with what they have not, namely a double bottom, on which the Japanese Government rightly insisted. The high speed, therefore, attained by the vessel is all the more remarkable. Her dimensions are as follows:—Length 350 ft., beam 46 ft. 6 in., and a displacement of 4,150 tons; her engines, which are by Messrs. Tennant, Humphrys and Co., develop 15,500 I.H.P., and during the trial worked without any hitch. The speed attained, 23 knots, was the mean of 4 runs on the measured mile. The actual speeds recorded were as follows:—1st run against the tide, 22.642 knots; 2nd run with the tide, 23.377 knots; 3rd run against the tide, 22.7 knots; 4th run with the tide, 23.762 knots. The final six hours natural-draft trial gave a mean speed of 21.6 knots, the contract speed having been 21 knots only, with 10,000 I.H.P. In the turning circles it was shown that the ship could turn through 360°, in 3 minutes, 8 seconds; the diameter of the circle in which she turned measuring 375 yds. The helm can be put from hard-a-port to hard-a-starboard in thirteen seconds, and the engines can be reversed from full speed ahead to full speed astern in a few seconds. Her armament consists of four 6-in. Q.F. guns, one on the poop and one on the forecastle, with a firing arc of 270°, and the other two sponsored out on either bow just abaft the forecastle; eight 4.7 guns, twenty-two 3-pr. Q.F. guns and five torpedo-tubes.

Turkey.—The 2nd class cruiser "Hejbet-Numa" is to take the place of the old wooden spar-decked corvette "Mehmet-Selim" as the training ship for naval

cadets. The "Hejbet-Numa" is a new ship, having been launched in 1890 from the Imperial Dockyard at Constantinople. She is 223 ft. long, 35 ft. beam, has a displacement of 1,960 tons, and engines of 2,700 H.P. nominal. Her armament consists of three 6-in. and six 5-in. guns, six small Q.F. guns, and two torpedo-tubes. The battle-ship "Hamidije," which was launched as long ago as 1885, has at length been completed, but has not yet received her armament. She is a small reproduction of the "Messudije," which is the model from which she has been built. She was originally called the "Nussretije," but was later on renamed after the reigning Sultan. Her dimensions, &c., are: Length 292 ft., beam 55 ft. 6 in., displacement 7,920 tons, and engines of 4,500 I.H.P. She has a complete water-line 9-in. belt, with a central casemate of 5-in. armour, and 4-in. traverse bulkheads. Her armament is to consist of ten 10-in. Elswick guns, five 6-in. Krupps, six small Q.F. guns and two mitrailleuses.

Three of the older ironclads are being altered. Of these the "Osmanije," which is practically finished, is a ship of about the same dimensions as the "Hamidije," and was built originally with an armoured central battery; this has been done away with, and in its place an unarmoured central battery, similar to those in the English "Admiral" class, has been substituted, her unarmoured sides before and abaft have been cut down to what was the main deck, and two armoured turrets fore and abaft the central battery, each carrying one heavy gun, have been added. The "Asisije" and the "Orkanije," ships of the same size and tonnage, are being similarly transformed. Their armament in the future will consist of two 10-in. Krupp guns, one in each turret, eight 6-in., six 4-in. Krupp guns in the battery, and eleven small Q.F. guns, with two torpedo-tubes. Work is also progressing slowly upon the new armoured cruiser "Abdul-Kader," the 1st class cruiser "Hudavendikiar," and the 3rd class cruisers "Zohaff" and "Sedd-ül-Bahr"; all these vessels are being constructed in the Naval Arsenal.

There is some talk of constructing a harbour at Immortalik, in view of the discovery of coal between Mersina and Alexandretta.

An order has been given to paint all the torpedo-boats black in place of the grey which has been used up to the present time; this decision has been taken in consequence of the grey colour showing out so much more distinctly under the electric light. The usual torpedo-boat exercises in the Gulf of Ismid have been omitted this year. ("La Marine de France.")

MILITARY.

Austria-Hungary.—The "Rev. Mil. de l'Étranger" gives the following details regarding the recent augmentation of the field artillery, in consequence of which the inferiority of that arm, in point of numbers, as compared with the artillery of the other great Powers, will disappear. Up to the present time the 14 brigades of artillery have been distributed among the 14 army corps of the interior of the monarchy, each brigade furnishing to its corresponding army corps 1 regiment of corps artillery (2 groups of 3 batteries each) and 3 independent groups of divisional artillery (each of 3 batteries); in all 15 batteries. From the beginning of 1894, the number of guns will be increased and the grouping of the units will be altered. In each brigade a new field battery will be raised, bringing the number of batteries at the disposal of the army corps up to 16. The batteries being of 8 guns, the army corps will thus dispose of 128 guns. In the matter of organization, the artillery brigade will be subdivided into 4 regiments, each of which will consist of 4 batteries, 1 ammunition park cadre, and 1 dépôt cadre. 3 of these regiments will be divisional artillery respectively, and 1 will be corps artillery. Thus, each

division will have 4 batteries instead of 3, and the corps artillery will be reduced from 6 to 4 batteries. The total field artillery will therefore consist of—

- 56 regiments of field artillery, as above;
- 8 groups of horse artillery of 2 batteries each (6 guns per battery);
- 1 independent group of mountain artillery of 3 batteries;
- 11 mountain batteries stationed in the territory of the XVth Army Corps.

On the war footing the total number of field and mountain guns will be 2,024 exclusive of reserve batteries, the number of which is not exactly known.

Belgium.—During recent cavalry manœuvres at the camp of Beverloo, 9 cyclists of the carabiniers were attached to the cavalry, 4 to the staff of the cavalry division, 1 to each of the 4 regiments, and 1 to the staff of the two horse artillery batteries. According to "La Belgique Militaire," the cyclists were employed as follows:—During the marches of the corps from their several stations to the manœuvre ground, they preceded their respective units and acted as billets, and, on the arrival of the regiments in quarters, were employed by the commanding officers as messengers. On the assembly of the division, the whole of the cyclists were attached to the division commander, who is said to have been astonished at the ease and rapidity with which they conveyed orders and reports on the frightfully bad bye-roads in the neighbourhood of the camp and over very broken and sandy heath-land. The misunderstandings and jealousy which arose on former occasions seem now to have entirely disappeared, and all ranks of the cavalry appear to have thoroughly appreciated the valuable assistance which the cyclists were able to render them.

France.—The mounting of reserve officers on troop horses of the standing army is being carried out on a large scale during the current manœuvres, and even in the case of all reserve officers whose regiments do not take part in army corps or brigade manœuvres, troop horses are to be provided by the cavalry and artillery regiments on the spot or within certain considerable distances, so that the whole of the staff officers and company commanders will be mounted and provided with saddlery during the entire duration of their exercises. ("Rev. du Cercle Militaire.")

In the course of the present year the marine artillery is to be reorganized, and placed on a similar footing to that of the marine infantry. 6 batteries of field artillery, 4 mountain batteries, and 13 fortress batteries are to be permanently stationed in France, and 10 batteries in the colonies. A staff consisting of several general officers is to be created, which will regulate all technical matters and the manufacture of matériel, guns, and ammunition for the arm, and will also supervise the execution of all contracts given to private manufactures. The object of this organization is to ensure the marine artillery being more flexible and ready for action at short notice, especially with regard to expeditions beyond the seas.

General Dodds, in his report on the operations in Dahomey, speaks in the highest terms of the Lebel rifle. Although circumstances did not admit of the firing of volleys at a greater distance than 1,000 metres, the moral effect of the weapon was found to be far greater than that of the Gras rifle with which the Senegalese Rifles were armed, and the accuracy and results of the fire from troops which could not be seen, and were advancing from an unknown quarter, caused great demoralization in the ranks of the enemy.

Germany.—The Inspection of Jägers and Rifles has issued a pamphlet of instructions for the care, training, and employment of dogs for military purposes.

The following table, extracted from the "Rev. Mil. de l'Étranger," gives a more complete view of the peace effective and units of the German army under the new law than we were able to present in last month's "Notes." Being issued by the French General Staff, it may be looked upon as practically correct.

	Numbers under the law of 15 July, 1890.	Increase under the new law.	Present peace effective.
Number of men incorporated annually	175,000	54,000	229,000
<i>Peace Effective.</i>			
Officers	20,662	1,793	22,455 ¹
Under-officers	66,952	10,912	77,864 ²
Men.....	420,031	59,198	479,229
			557,093
1-year volunteers	9,000	"	9,000
Medical officers	1,840	228	2,068
Veterinary surgeons	558	20	578
Paymasters	895	207	1,102
Armourers and saddlers	947	206	1,153
Total	520,885	72,564	593,449
Troop horses	93,750	3,094	96,844 ³
<i>Number of Units.</i>			
Infantry battalions	538	"	538
Half 4th battalions (2 companies)	"	173	173
Squadrons	465	"	465
Field batteries	434	60	494
Foot artillery battalions	31	6	37
Pioneer battalions	20	3	23
Railway battalions	5	2	7
Train battalions	21	1 company	21
(less 1 company)			

¹ Exclusive of gendarmerie, officials of intendance, military justice, administrative services, &c.

² Exclusive of gendarmerie, subordinates in administrative services, military justice, &c.

³ Exclusive of about 18,000 officers' horses, 1,900 horses of 1-year volunteers, and 3,200 "Krümpers" (cast horses retained for regimental purposes, and not provided for in the Budget).

A cabinet order of the 19th May prescribes a course of instruction in firing with reduced charges for all troops armed with rifles or carbines, specially modified arms being provided for the purpose. Some details of the system adopted are given in the "Rev. Mil. de l'Étranger" for July.

Special interest is attached to the siege manœuvres at Thorn, concerning which the Danzig Journal remarks to the following effect:—An entirely new method of attack will be practised, the details of which have been so far kept secret. For the regular attack a new procedure will be tried, and an "accelerated attack" will be carried out, the object of which is to curtail the several stages of attack and shorten the duration of the works of approach. An attack in force is contemplated in which all the special means of protection will be dispensed with, and the attacking troops will be immediately launched against the enemy entrenched in his defensive works. The bombardment will naturally play a considerable rôle, seeing that it will still be necessary to destroy the material means of the defender by fire, and at

the same time to break down his *morale*; but the most important object will be to attempt to bring about a decision by overwhelming infantry attacks and to determine whether or not it is possible to carry a strong place by assault. In these manœuvres masses of infantry, as well as cavalry, artillery and pioneers will be engaged, and it is probable that a regiment of landwehr artillery will be formed for the occasion.

(Since the above note was printed, it has been announced that these manœuvres will be deferred.)

The "Mil. Wochenblatt," No. 71, draws attention to the new "von Dammitz" curb-bit, which generally resembles the regulation cavalry bit. The peculiarity of the new bit is that it can be removed from the mouth instantaneously, without necessitating the removal or disarrangement of the bit head-stall, and the object of the invention is to enable horses to be fed or watered on service while preserving the power of replacing the bit immediately in case of surprise. It is thought that this modification will prove of great service to men on patrol duty or other detached work.

Experiments are being made in Bavaria with drums, the body and mountings of which are made entirely of aluminium. In ordinary side-drums the diminution in weight is said to exceed $2\frac{1}{4}$ lbs. ("Rev. du Céle Mil.")

The "Militär-Wochenblatt," No. 76, gives a description of a travelling compass, termed the "Magnet-Pfadweiser," which is recommended for use at night in situations where it is impossible to use artificial light.

Netherlands.—Some details of the various projects for the reclaiming of the Zuiderzee, a question which is so intimately connected with the defence of Holland, are given in the "Rev. Mil. de l'Étranger" for July.

Russia.—The post of "Inspector of Cavalry Remounts and of Brigades of Dépôt Cavalry" has been created. The remount system in force in Russia is briefly as follows:—For each regiment of the regular cavalry (10 of the Guard and 48 Dragoon regiments) there is a section-cadre. The duties of these sections are to train the remount horses of their respective regiments in time of peace, and, in time of war, to form dépôt squadrons from which to replace casualties in men and horses. The 58 sections are grouped in 15 cadres of dépôt cavalry, which again are grouped in 8 brigades. On the peace footing the total effective of these brigades is 220 officers and officials, 5,238 men, and 5,384 horses. In each cadre an officer is charged with the purchase of horses. The special duties of the Inspector are detailed in the "Rev. Mil. de l'Étranger" for July.

Switzerland.—The manœuvres of the IIInd Army Corps (3rd and 5th Divisions), under the direction of Colonel Feiss, will last from the 5th to the 14th September, and will comprise 2 days' brigade manœuvres, 2 days' divisional, and 4 days' Army Corps manœuvres, the inspection taking place on the 14th. The general idea for the corps manœuvres is that an enemy (the 3rd division) has crossed the Haut-Doubs and is crossing the Jura against Bâle, while a Swiss Army operates with its principal forces in the "plateau suisse" with the 5th Division at Birsthal.

FOREIGN PERIODICALS.

MILITARY.

Militär-Wochenblatt.—No. 68. "Tactical Deductions from the Battle of Wörth." (This is the first instalment of an essay, founded on the studies of Major Kunz, Major Keim, General v. Boguslawski, &c., the object of which is to answer the question "How should we now fight this battle, with our present knowledge derived from military history and with our improved firearms?"). "Review of the Latest Inventions and Discoveries, Chemical and Technical, affecting Military Art" (continued). No. 69. "Tactical Deductions from the Battle of Wörth" (continued). "Review of the Latest Inventions, &c." (continued). "The West Point Military Academy." No. 70. "Tactical Deductions, &c." (continued). "Two New Heavy Russian Guns." No. 71. "Tactical Deductions, &c." (continued). "Review of the Latest Inventions, &c." (continued). "A New Curb-bit" (see "Military Notes"). No. 72. "Further Remarks on the New German Cavalry Drill Regulations." "The Changes in the French Law of Cadres." "The Italian Army Budget." No. 74. "Fix Bayonets" (A long essay on the real use of the bayonet at various epochs from the time of Frederick the Great to the present day). No. 75. "Fighting Orders during Manœuvres." (Considerations on the importance of practising the giving of written orders). No. 76. "How to spare the Troop Horses during the Manœuvres." No. 77. "Diminution of Intervals between Guns, and Intermixture of Units in the Fight of Field Artillery." "Professor Hebler's Heavy and Light Tubular Bullets."

Beihet zum Militär-Wochenblatt.—Heft 9. "Memoir of the late General of Artillery R. von Roerdansz."

Jahrbücher für die Deutsche Armee und Marine.—August. "The Campaign of 1809 in the Tyrol, &c." (continued). "The Fight on the Katzbach, 26th August, 1813." "The Franco-German Paper War regarding the Armoured Turret" (continued). "Contribution to the History of Small-calibre Quick-firing Guns." "The Recent Army Reform in Spain." "Attack of the Russian Infantry. Comments on Major-General Skugarevski's Work."

Organ der Mil.-Wiss. Vereine.—Heft 1. "The Employment of Infantry and Rifle Battalions in the Reconnaissance Duties of Cavalry Divisions." "Russian Views as to Firing on Horseback."

Journal des Sciences Militaires.—August. "Objectives, Directions, and Fronts" (continued). "Strategy of Marches" (concluded). "Frontiers and Fortifications of the Principal Powers—Great Britain and Colonies." "The New Methods of Instruction" (concluded). "The Strength of the Army—Cadres and Troops." "The Campaign of 1814" (continued). "The Maintenance of Direction in the Marches and Evolutions of Infantry." "Remarks on the Political and Historical Geography of Central Europe." "The English Campaign in the Soudan, 1884-85" (continued).

Spectateur Militaire.—1st August. "Field Works and Shields" (for infantry). "The Elections and the Grand Manœuvres." "A Year's Column Work in Algeria" (continued). "Les Cent-Suisses" (continued). 15th August. "Re-organization of the German Army." "Field Works and Shields" (concluded). "A Year's Column Work in Algeria" (continued). "Les Cent-Suisses" (concluded).

Revue du Cercle Militaire.—No. 32. “The Mekong.” “The Hamidié Cavalry” (*concluded*). “The Proposed Reorganization of the Italian Army” (*continued*). No. 33. “The Normal Calibre for the Infantry Rifle” (*à propos* of the recent utterances of General Wille and Professor Hebler). “The Use of War Dogs in the German Army.” “The Proposed Reorganization of the Italian Army” (*concluded*). No. 34. “The Army of the Vosges in 1871. The Fight at Crépand (Côte-d’Or).” “The Use of War Dogs in the German Army” (*continued*). “The Normal Calibre for the Infantry Rifle” (*continued*). “The New Austrian Portable Tent.” No. 35. “Ricciotti Garibaldi in the Côte-d’Or in January, 1871” (a letter from Colonel R. Garibaldi with reference to the article on the “Fight at Crépand.”) “The Schools of Instruction in Paris and in the Provinces.” “The Normal Calibre” (*concluded*). “The Use of War Dogs, &c.” (*continued*).

Revue Militaire Suisse.—August. “Critical Observations on the Organization of the Swiss Infantry” (*continued*). “The German and French Military Forces.” “Was Berlin or Paris time kept by the German Army when operating in France in 1870-71?” (*à propos* of the recent discussion in “L’Avenir Militaire” between M. Duquet and General Hanrion).

Journal of the U.S. Cavalry Association.—June. “Military Geography of Mexico” (with map). “The Carbine—How it should be carried mounted.” “Cavalry upon the Field of Battle” (*concluded*). “Mountain Scouting.” “Conversations on Cavalry (Prince Kraft zu Hohenlohe-Ingelfingen)” (*continued*). “Duties of Cavalry in Modern Wars.” “The Cavalry Horse.” “The Feeding, Watering, and Shoeing of the Cavalry Horse.”

NOTICES OF BOOKS.

Semi-Azimuths. A New Method of Navigation. Part I. By E. W. BULLER, Vice-Commodore, New Thames Yacht Club. London: Norie and Wilson, 1893. Price 2s. 6d.

The author of the work before us has evidently devoted much time and trouble in developing his system of navigation. We have no means of testing his work practically ourselves, but we gather, from what he says himself, that his method has produced satisfactory results where it has been fairly tried. Should this be correct, and seamen generally find that this new method of ascertaining a ship's position is accurate and to be relied upon, the author will undoubtedly have the credit of having taken a long step forward in simplifying the science of navigation. To “find the position of a ship at sea from a single observation made at any time” is unquestionably, as the author claims for it, a real step in advance. The working base of his method is the junction of the two systems of spherical trigonometry and Mercator's sailing, and by the combined use of these it is sought to fix points hitherto indeterminate. The two systems—spherical and Mercator—are thoroughly established and familiar to all conversant with navigation. The author does away with the long and tedious work involved in finding the latitude by double altitudes, and his method apparently does not require any special tables; should it free navigation from the excessive multiplicity of tables, with which it is now encumbered, it would be another great gain. We only hope Mr. Buller's system will have a fair trial, and prove as successful in its object as he evidently believes it will; should it do so he will have earned the gratitude of all navigators.

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The Refounding of the German Empire, 1848—1871. By Colonel G. B. MALLESON, C.S.I. With Portraits and Plans. London: Seeley & Co., 1893. Pp. 326. Price, 5s.

This work, which is one of the "Events of Our Own Time" series in course of publication by Messrs. Seeley and Co., deals with a period of German history of 23 years' duration. During this period there occurred in Europe five wars, three of which, viz., the Danish, Austro-Prussian, and Franco-German wars, were the three steps which made possible the refounding of the German Empire. The initial war, in fact, was needed to cause the second, as the second was necessary to produce the third, and the Danish war, far from being a war of secondary importance, was the first act of a deliberately-planned system; the first consequences of the introduction of that policy of "blood and iron" which, in one of his earliest speeches to the Prussian Parliament, Count Bismarck declared to be necessary for the solution of the great questions which were agitating Germany. It is scarcely necessary to say that Colonel Malleson's book makes no pretension to be a text-book of the military history of the period referred to, although the chief military events and the most notable battles in the important campaigns above mentioned are described in sufficient and correct outline; but the work can be cordially recommended to all who wish to gain a clear and comprehensive view of the circumstances and combinations, political and military, which led to the re-founding of the German Empire.

Bombay, 1855 to 1890. A Study in Indian Administration. By Sir WILLIAM WILSON HUNTER, K.C.S.I. London: H. Frowde, 1892. Pp. 504. Price, 15s.

This work originated in a request from Miss Florence Nightingale that the author would write a book which should show the practical working of British administration in an Indian Presidency. The author treats his subject as follows:—After a brief sketch of the country and of the diverse peoples which inhabit its four speech-divisions, the framework of the Presidency Government is described, its internal constitution, its relations to the supreme Government of India, to the provincial administrative body, and to the multitudinous native States. The system of government is then exhibited in contact with the population of the British districts, and the author, in successive chapters, considers the questions of education, land and forest administration, public works, finance, excise, and general taxation, judicial and police systems, the development of local self-government, changes in the armament and defence of Bombay, and the relations of Sind, Aden, and the Portuguese Possessions. So far as we know this is the only work which aims, by the aid of historical retrospect and recent illustrations, to give a general view of how a great Presidency of British India is governed in our own day, and, coming as it does from the hand of a skilled writer and master of Indian history and administration, it is needless to say that the object of the work is fully attained.

Battalion Drill made Easy, with Explanatory Notes. In accordance with the Newly Revised Infantry Drill. By WILLIAM GORDON. 1893. 9th Edition. Gale and Polden. Price 2s.

Company Drill made Easy, with Explanatory Notes. In accordance with the Newly Revised Infantry Drill. By WILLIAM GORDON. 1893. 9th Edition. Gale and Polden. Price 1s. 6d.

These manuals, like the rest of Mr. Gordon's admirable hand-books, are so well known that it is only necessary to call attention to the fact that the 9th edition brings them up to date.

Guide to Promotion: an Aid to Officers of all arms in Preparing for Examination in Regimental Duties. Part II. Rank of Major. By Lieutenant Colonel SISSON C. PRATT (late Royal Artillery). London: Stanford. 1893. Price 7s.

As in the case of Lieutenant-Colonel Pratt's "Guide to Promotion, Part I," the system of question and answer followed by Lieutenant-Colonel Bannatyne has been adopted; the answers, however, are not mere verbatim quotations from the

text-books ; but, while strictly founded on the latter, aim at giving the substance of the regulations in the clearest and most concise manner. This volume contains all the subjects comprised under the head of regimental duties required to qualify for the rank of major, in addition to those already detailed in Part I.

LIST OF RECENT FOREIGN BOOKS (MILITARY).

Cours de Fortification Passagère, I Partie : La Fortification en Liaison avec la Tactique. With atlas of plates. By Captain V. DEGUISE. Brussels : Weissenbruch, 1893. 15 fr.

Reviewed at some length, and very favourably, by the principal foreign periodicals. Well up to date, and takes into consideration the effect on field fortification of present arms with smokeless powder.

Les Méthodes de Guerre. By General PIERRON. Tome i, Part 3. " Railways and Telegraphs." Paris : Baudoin, 1893. 8 fr. 50 c.

Campagne de la Loire en 1870—1871. Coulmiers et Orléans. By P. LEHAUT-COURT. With 6 maps. Paris : Berger-Levrault, 1893. 7 fr. 50 c.

L'Angleterre devant ses Alliés (1793—1814). By P. COTTIN. Paris : Bureau de la Revue Rétrospective, 1893. 2 fr. 50 c.

This brochure is written with the object of showing the three continental powers what an *entente cordiale* with England costs, and of proving that she is quite as much to be feared by her friends as by her foes.

Die Kaukasische Kasaken-Brigade im Balkan-Feldzuge 1877—78. Kriegssgeschichtliche Studie. By Lieut.-Colonel T. VON TROTHA. Berlin : Mittler, 1893. 4 mks.

Über Anlage und Durchführung der Manöver. By Colonel WILLE (Chef d'Arme of the Swiss Cavalry). Frauenfeld : Huber, 1893. 75 pf.

This little pamphlet regarding the planning and conduct of manœuvres is spoken of in the highest terms by the foreign military press.

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